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CONSOLIDATING OUR GAINS*

By Willford I. King
New York University

Statistics is frequently referred to as one of the youngest of the sciences, and it is undoubtedly true that youth is a characteristic of a large proportion of the complicated technique now employed in dealing with masses of data. This is, however, far from saying that the most elementary principles of statistics are of recent origin. Bowley defines statistics as "the science of counting." If we accept this definition, it follows that, among early statisticians, we must certainly include both the clever Inca who devised a method of enumerating his llamas by tying knots in his whips, and the keen-minded Roman who converted a crude system of tallying into a notation which enabled him to compare at a glance the sizes of large numbers.

Enumeration forms the prime basis for both mathematics and accounting, and without these aids, it is hard to conceive of social organization advancing to any noticeable extent. Apparently, therefore, we statisticians cannot be accused of undue boasting if we assert that, to no small degree, civilization rests upon a statistical foundation.

It must be admitted, however, that such records as have come down to us seem to indicate that, before the Renaissance, statistical work, for the most part was confined mainly to simple enumerations of population or property. There were, however, notable exceptions to this rule. Researches conducted by that careful and erudite student of statistical lore, the late Edwin W. Kopf, indicated that the life tables devised by the vital statisticians of Augustus Caesar's day were practically applied in Italy for something like a thousand years. What is even more astounding, he found that, in Ancient Babylon, our science

* Presidential address at the Ninety-seventh Annual Meeting of the American Statistical Association, New York City, December 30, 1935.

had made such remarkable progress that life tables were available and were used in writing most of the forms of life insurance in vogue in the United States today. Who knows but that while we are celebrating, in 1939, the centenary of the American Statistical Association, and preening ourselves upon the long life of our organization, the cables may carry a message something like the following:

"Archaeologists unearthed today in Babylon a remarkable set of clay tablets recording the minutes of the 1242nd annual meeting of the Babylonian Statistical Association."

In view of the fact that these achievements of ancient statisticians have for so long been lost in the mists of antiquity, it may well be that other of our supposedly new devices may be nothing more than revivals of procedures, once commonly employed, but now long forgotten. Until, however, evidence to this effect is forthcoming, the conclusion seems to be warranted that until comparatively recent times, statistics, for the most part, consisted merely of more or less complete enumerations of the inhabitants, and especially of the fighting men and resources needed for war purposes. The very name statistician indicates clearly that the original worker in this field was looked upon primarily as a servant of the state.

As long as statisticians served mainly in that capacity, the utilitarian nature of their work seemed clear to nearly everyone. When, however, in the Seventeenth Century, Obrecht, Graunt, Neumann, and Petty began dabbling in records of births and deaths, the practical man of the day probably looked upon these four, much as we now do upon the collectors of the wooden Indians, which once stood before cigar stores. When, however, a little later, Halley, by aid of their figures, rediscovered the art of making mortality tables and thus established the basis for modern life insurance, it became evident that the work of even these visionaries possessed a high degree of utility. Similarly, when mathematicians like Pascal, the Bernoullis, de Moivre, Gauss, Laplace, Cournot, and Poisson developed the theory of probability, the chances are that few people believed that this theory could ever be applied to problems relating to everyday life. However, even while the theory was developing, Süszmilch, Necker, Malthus, Fuchs, Lombard, Quetelet, Farr, and many other lesser lights, were showing that such abstract mathematical research was of real importance in solving the social problems of the day.

Perhaps it was observation of the fact that so many important practical results were being unexpectedly derived from masses of apparently useless data which led Lavoisier, writing around 1791, to announce that if only the French National Assembly would arrange to collect

adequate information concerning agriculture, population, commerce, etc., the resulting report "would contain in a small number of pages the entire science of political economy, or rather this would cease to exist; for the results would be so clear, so palpable; the different questions which one could raise would be so easy to resolve, that it would no longer be possible to have any diversity of opinion."[1]

Antoine Lavoisier has long since been gathered to his fathers. For many years, the masses of statistical information for which he prayed have been collected and placed at our beck and call. Every decade, for example, our Census Bureau fills an eight-foot shelf with thin-leaved volumes closely packed with figures, and from these we can glean information on a thousand topics. Much progress has undoubtedly been made in the direction of putting the social sciences upon a firmer foundation. Even so, however, if, during the last few days, the shade of Lavoisier has happened in at our sessions, it is to be feared that he has been both surprised and grieved to learn that, despite the numerous statistical tomes at their disposal, some of our most highly trained specialists are not in perfect accord as regards the wisdom of the Government's spending policy, that others are not in complete harmony on the money question, and that some few even show traces of disagreement concerning the merits of the various phases of the New Deal.

With our present accumulation of hind sight, Lavoisier's faith in the potency of massed figures seems strangely naïve. It may well be, however, that, had we lived in Lavoisier's day, we too might have felt that, with an adequate supply of data, the truth would inevitably stand clearly revealed.

It was only after many decades of experience with masses of data, that statisticians learned that one cannot build the tower of science merely by piling figures upon figures. Two generations after Lavoisier, the German Historical School of economists still exhibited for masses of data a reverence and faith almost as childlike as that of Lavoisier.

Lavoisier's enthusiasm over statistics—the new device which seemed so promising—is easily comprehensible. The undue persistence of this point of view was, however, unfortunate, for it led to the waste of much energy in the gathering of data which were practically useless when collected. Wherever there prevailed this emphasis upon data, rather than upon reasoning, science made but little progress.

This does not mean, however, that one is justified in belittling the importance of having adequate statistical bases upon which to build our scientific superstructures. In the United States, we are, indeed

[1] Quoted by Harold Westergaard in his *Contributions to the History of Statistics*, p. 99.

fortunate in having available as foundation material our magnificent collections of Census data. The student of dynamic economic and social problems should be ever grateful for the *Statistical Abstract* and the *Survey of Current Business* which gather together in extremely convenient form numerous series of comparable annual or monthly figures, which series enable him to interpolate between the Census dates and thus measure changing relationships of cause and effect. Unfortunately, however, there is one fly in the statistician's ointment. It is that, all too frequently, no coördination exists between the basic Census data and the series which must be used for purposes of interpolation. For example, the United States Bureau of Labor Statistics collects various series recording changes in hours worked per week, but one searches the Census in vain for corresponding data. Similarly, the United States Bureau of Agricultural Economics notes changes in the rates of pay of agricultural workers paid by the month and of others paid by the day, but the Census figures do not tell us how many workers were paid in each manner during the Census period. On the other hand, the Bureau of the Census records the number of persons reporting themselves as bookkeepers at the beginning of each decade, but we have no annual index from which to estimate the changes which are occurring from year to year in the size of this group.

Fortunately, real progress is being made in the direction of coördinating the statistics collected by different Federal Departments, and many gaps are being filled in. On the whole, we are justified in taking great pride in our splendid collection of basic statistical information, and we should feel it our duty to work for the improvement of these essential figures. At the same time, however, we should remember that collecting basic material is an extremely expensive process, and that, in deciding what additional data are worth while, the interests of the taxpayers, as well as those of the users of statistics, should always be kept in mind. In every instance, the question should be raised: "Are the figures worth what they cost?"

There can, for example, be no doubt that we statisticians are served better by having a census of agriculture every five years than by having one every ten years—and that it is also to our advantage to have biennial rather than quinquennial or decennial censuses of manufactures. When, however, we consider the great number of year by year and month by month series prepared by the Bureau of Agricultural Economics, by the Department of Labor, or by the Department of Commerce, and when we consider further the fact that frequency of enumeration often means a sacrifice in the completeness of each and every enumeration, and hence the disappearance of any really adequate

census basis for many series, a question arises as to whether the extra dollars invested by the taxpayers in order to secure frequent enumerations might not be better spent.

At present, plans are being completed to make the population census quinquennial rather than decennial. In view of the fact that our Association has repeatedly endorsed this move, I realize that to question its advisability may be near treason. It goes without saying that health officers need reasonably accurate bases for use in computing sickness rates. Are we sure, however, that, were we to expend on the utilization of existing data one tenth of the cost of a census, it might not prove feasible to approximate closely enough for practical purposes the population of all the larger segments of the United States? Can we justify the expenditure of millions of dollars for an additional population census before any serious effort has been made to ascertain whether or not data already available can be made to yield the major part of the information which the census is designed to provide?

It is undoubtedly true that statistical science can get nowhere unless it is based upon a broad and firm foundation of accurate data. This foundation needs, however, to be built according to plan, and to have the various sections carefully coördinated. Furthermore, in planning the foundation, the matter of cost should always be kept in mind, for cost is as important to the nation as to any private builder.

Unfortunately, in our own as well as other countries, the rules just laid down have been as frequently overlooked as observed. We have had far too much sporadic and often aimless collection of data. With a faith as childlike as that of Antoine Lavoisier, Congressional Committees vote for elaborate inquiries without having any clear understanding of what uses can be made of the figures after they have been collected. In some cases, the result is to clutter the archives with cords of dust-gathering volumes of figures answering no definite questions and related to none of the major bodies of existing data. At the same time that Congress appropriates money for such aimless figure collecting excursions, it hesitates long to furnish the very minor sums needed to pay for publishing important tabulations obtained in connection with the regular decennial Census.

While Congress has often been guilty of fostering the collection of masses of practically useless data, it has remained for the present Alphabetocracy to reduce this process to a fine art. To no small extent, this has been the result of considering figure gathering, along with boondoggling, as an ideal form of "made work." When a lazy-minded or unimaginative relief administrator cannot conjure up anything useful for his "white collared" protégés to do, he can always set them to

counting one thing or another. A favorite task seems to be the impossible one of counting the number of unemployed. Perhaps one of the reasons adding materially to the attractiveness of this undertaking is the difficulty of deciding whether the counter himself is or is not unemployed.

Not only relief, but the general necessities of a modern bureaucracy require figure collecting on a hitherto unheard of scale. Formerly, John Smith, God and his wife permitting, planted his corn and cotton and sold his hogs and potatoes when and where he pleased. Today he must file a detailed report of his past performances (whether actual or constructive depending upon his ethical standards and the prying proclivities of his neighbors), and of the program which he nominally, or perhaps really, intends to follow in the future. Handling these reports provides jobs for an army of statistical clerks and prestige for many a hitherto unknown administrator. And so it is likewise in many other industries, and would be in all were it not for the unhappy tendency of the Supreme Court to blight the promising careers of so many embryo statisticians and bureaucrats. However, we can all find some solace in the fact that the fledgelings of the late, and by some lamented, blue eagle were given a year in which to record statistically the numerous deeds and misdeeds characterizing his brief but colorful existence.

At present, we statisticians are likely to find ourselves torn by two conflicting emotions. As breadwinners, we realize that the more figure collecting is done, the stronger is the demand for statisticians and the greater the probability that we can add to our supply of shekels. As scientists, on the other hand, we know that the public in general, and business men in particular, are becoming so annoyed by the growing number of calls for statistical data that they are refusing to furnish to long established Governmental agencies such as the Bureau of the Census, the information needed as a foundation for all our statistical studies. Furthermore, as citizens, we cannot overlook the fact that many of the inquiries are costing far more than the results are worth. Perhaps we may more readily overcome the urgings of self-interest if we pause to consider the fact that increased demand for statistical workers soon generates an increased supply, and that therefore, our monetary gains are likely, at best, to be but short-lived.

Clearly, the national welfare demands an adequate, but not excessive, mass of sound, thoroughly coördinated data as a base line upon which our advances must be founded. The best way to advance from this base line, is by means of studies carefully designed to answer very specific questions. In selecting questions to be answered, we should always consider both the importance of having the question answered

and the cost of answering it. To know whether there are eight millions or ten millions of people who call themselves unemployed may be interesting but of slight importance. In either case, the number is vastly too large. The thing which is important is to know why many people are idle and how they can be set to work producing useful goods. Perhaps the latter information can be gathered at but a fraction of the cost of the former.

During the last quarter century, both governmental and private research organizations, and also many individual statisticians, have been diligently and successfully engaged in pushing forward important lines of knowledge. Up to the last decade, it was commonly assumed that any statistical advance made anywhere would automatically become the gain of all science. Perhaps the Social Science Research Council was the first body forcefully to call attention to the fact that various individuals and organizations were often completely unaware that others were working along almost identical lines. It remained, however, for the depression year of 1930 to 1932 to bring out vividly the fact that the world at large knew almost nothing of the facts established by statistical research. Most of the ancient fallacies which the scientists of a century ago considered they had laid to rest for all time, were resurrected and their ghosts were soon warmly accepted in high circles as being real flesh and blood.

Apparently in complete ignorance of the facts so clearly established by the painstaking research of men like Carl Snyder and O. E. Baker, scaremongers told us that the nation was about to be overwhelmed by a sudden deluge of products from our farms and factories, and that we must, therefore, prepare to maintain in permanent idleness a large proportion of the nation's erstwhile working force. Others, equally uninformed concerning the work of the Brookings Institution, the National Bureau of Economic Research, and the National Industrial Conference Board, asserted vehemently that we were suffering from having invested too much of our resources in machinery and equipment and that we were in danger of being crushed by overcapacity for production. While not all of these ghosts have yet been driven back to their graves, it is gratifying to report that marked progress in that direction is clearly visible.

Perhaps this habit of reviving economic and statistical fallacies is inherent in the depression spirit. However, other sciences do not suffer similarly. The business collapse of 1929 to 1932 did not cause geographers to return to the belief that the world is flat, did not cause biologists to revert to the idea that sickness was the result of witchcraft, did not even revive among chemists the phlogiston theory. The tend-

ency to resurrect long-dead fallacies seems to be peculiar to the social science. Perhaps this defect is inherent and cannot be remedied, but it seems worth while to make some attempt to effect a cure.

One thing which the field of statistics obviously lacks is a convenient way of discovering, as regards any given subject, what statistics are available. In other words, we need an adequate bibliography of statistical material. Existing bibliographers as a rule, refer merely to whole volumes of figures and tell little or nothing about their contents. There is, for example, no catalogue to which one may turn and learn what statistical material exists which bears upon any particular subject.

The research worker often can do no more than grope blindly in the hope that he will stumble onto the figures which he desires. How, for example, can he be expected to know that a study of Negroes in industry appears in a monograph prepared by the Pennsylvania Department of Internal Affairs, that to find information concerning distribution of incomes by occupations he had best refer to a report of the New York State Tax Commission?

The lack of such an adequate bibliography of statistical material makes it impossible to avoid repeated duplication of effort. It also retards progress by preventing one statistician from building upon what another has done. The way to advance successfully is to have full coördination of effort—not to have each man depending solely upon his own diligence and ingenuity. A well organized catalogue of statistical information would greatly further such coördination.

To compile a really helpful bibliography would be a huge undertaking, for it would be necessary for the catalogues not only to differentiate source and secondary material but also to distinguish between statistical tables which are the results of years of effort by competent statistical staffs and those which represent nothing more than hasty guesses made by some enthusiastic publicist. The rating of statistical data would seem to be no impossible task but obviously it could only be done successfully by highly trained workers. To obtain such workers would add greatly to the expense of the enterprise. The Government could, however, much better afford to spend millions upon a project like this, which would strengthen greatly the foundations underlying all statistical work, than to pay out like sums for the collection of masses of data having at best transitory value. The construction of a great card catalogue citing and relating statistical data would be one way of consolidating the gains made by statistical science. It would be an expensive way, but would probably be worth more than it would cost. Fortunately, the preparation of a colossal card catalogue of statistics does not represent the only possible method of consolidating our gains. As previously stated, many statisticians have individually

advanced far ahead of the base trenches. They have proceeded by varying routes, and it is therefore hard to visualize the new advanced line which they have attained. Their positions need tying together.

The most feasible way of doing this seems to be to have competent and unbiased committees of specialists look into the results of the various studies known to exist in a given field, and thus ascertain exactly what facts have been thoroughly established and what lines of investigation need to be pursued further.

It is highly probable, for example, that, *in toto*, ample statistics are available to settle such questions as the following:

1. The effect of changing income upon the birth rate.
2. The relationship between temperature and sickness rates.
3. The effect of wage rates upon the volume of employment.
4. The interrelationships of money, credit, and prices.
5. The connection between price and wage rigidity and unemployment.
6. The effect of length of working time upon production.
7. The causes of depression.

Nevertheless, it is safe to assert that many skilled statisticians, to say nothing of laymen, are not sufficiently versed in the literature of the subject to distinguish between findings based upon adequate evidence and the mere assertions of ignorant enthusiasts or charlatans.

It is hoped that our recently formed Committee to Appraise the Statistical Evidence Concerning the Present Depression will blaze a trail which can be followed by similar committees dealing with other subjects. Were a series of such committees formed, each to evaluate and consolidate all available evidence relating to the particular subject assigned to the committee, the probabilities are that the results would be extremely beneficial not only to statisticians and social scientists but to the public at large.

At present, the crying need is not for more basic data, is not even for more research. What is really important is to enlighten the public in general, and our policy making and administrative officials in particular, concerning facts thoroughly established and well understood by specialists in the various fields of social science. Eventually, we hope and indeed fully expect to advance our outposts far beyond their present positions. Temporarily the forces of darkness are yielding ground slowly, but they may counter-attack. As Dr. Frederick C. Mills pointed out in his presidential address last year, we are inclined to take order and security for granted—just as we do air. The truth is, however, that eternal vigilance is the price of liberty. Since this is the case, the policy which at present is safest is to proceed at once to consolidate our gains.

THE MEANING OF PROBABILITY*

By Ernest Nagel
Columbia University

There is at least the appearance of presumption in the title of this paper. The title could be taken to imply that my object was either to legislate what meaning the term "probability" *must* have, or to settle summarily the many difficult problems which an analysis of the meaning of the term faces. Reflection on the follies of other philosophers who have ruled out as "meaningless" the meanings which scientists have assigned to certain terms, prevents me from undertaking the former task; and limitations of space, to say nothing of my own sense of unsolved difficulties, makes it impossible to attempt the latter. All that I wish to do is to make explicit certain generally recognized methodological principles to which, I believe, all rational inquiry appeals, and to test by their means three analyses of the meaning of "probability" which have been offered. One of Dickens' characters composed an essay on Chinese metaphysics by combining the contents of the encyclopaedia article on metaphysics with the information obtained from the article on China. However, even if, like the essay in Pickwick Papers, the present paper is simply a mechanical juxtaposition of some reflections on methodology and others on probability, I hope it succeeds in showing the relevance of the former to the discussion of the meaning of the latter.

I

I begin with the methodological principles.

1. If the term "probability" were being introduced for the first time, or in some special technical sense, into every-day or scientific language, its meaning would be given by specifying the occasion when it is to be employed, and by stating the rules which would govern its occurrence and relations to other terms in the language. Such a definition would be nominal and arbitrary, because the meaning of the term would be established by a resolution or convention, so that questions involving truth or falsity would not be relevant concerning the definition. Thus, the expression "work done by a body" was introduced as a technical term into physics by Coriolis, who used it to mean distance multiplied by the component of force. There are often good practical

* A paper presented at the Ninety-seventh Annual Meeting of the American Statistical Association, New York City, December 28, 1935.

reasons for introducing new terms into a language in this arbitrary way; and having once fixed the meaning of a term, it is of course no longer an arbitrary matter whether, for example, a given body is performing work or not. Nevertheless, the initial specification of meaning is arbitrary, because every dispute about the meaning would be decided by an appeal to a resolution made, and not by an appeal to matters of objective fact.

With respect to the term "probability" such is not the situation in which we find ourselves, except in those cases where a writer explicitly stipulates that he will employ it in some unique sense. The term is of great antiquity and is used in more or less determinate ways in various contexts. What it *does* mean in any given context cannot therefore be decided by an arbitrary resolution as to what it *shall* mean; and we cannot rule out some usages of the term as "meaningless" merely on the ground that such a usage does not conform to the usage we have decided to give it. Hence, whether the term "probability" has one meaning or many must be determined by a study of the different contexts in which it is employed. The univocality or equivocality of the term cannot be determined *prior* to such a study.

There seems to be but one reliable way of discovering what meaning or meanings the term "probability" does in fact have. For people assert propositions like "It is probable that it will snow to-night," "The probability that he will survive the operation is 3/5," "The photon has a probability of 3/4 of being reflected," "The helio-centric theory is more probable than the geo-centric one," and so on. Now we would discover what is meant by these propositions and consequently by "probability," if we could ascertain rules controlling the assertion of each, and therefore of the usage of the term. To put the matter in different language, if we can obtain an answer to the question "What *sort of evidence* would be regarded as relevant for propositions asserting something about probabilities?" we would obtain at the same time an answer to the question "What is meant by probability?"

This point may be made clearer by an illustration. Suppose a person X were to assert the proposition "Events A and B are simultaneous," and were to give as evidence for it the proposition that he saw them occurring within one specious moment. We would now know what X means by "simultaneity"; and we could legitimately conclude that he would judge a sudden increase in the brightness of each of two stars lying in an approximately straight line with his eyes as simultaneous events, if he were to observe the change in brightness within the same specious moment. On the other hand, if a person Y were to give as evidence for the proposition "Events A and B are simultaneous," the

proposition that an instrument placed half-way between them registers light rays having A and B as their source within a small interval of time as measured by a clock on the instrument, we would also know what Y means by "simultaneity"; and we could conclude that what X means by the term is not in general identical with what Y means by it.

It is an inquiry of this sort which seems to me necessary for determining what the term "probability" means. Such an inquiry is more than a project in anthropology or linguistics. For consider the following imagined situation: In virtue of what the term "work" means in physics, and by using other physical principles and data, we may validly infer from the proposition that a given body has performed a certain quantity of work another proposition, for example, that some other body suffers specifiable deformations. We are thus able to predict empirical states of affairs not yet examined and to regulate our behavior accordingly. Now suppose a person X, unfamiliar with the specific meaning and function of the term "work" as employed in physics, nevertheless believes that when a doorman of a hotel is said to be "working," just the same sort of consequences can be validly inferred from this as in the preceding illustration. It would still be the case that the term "work" would have a meaning for X, though a confused one. Nevertheless, it would be proper to criticise his use of the term "work" on the ground that the consequences he draws are not valid ones.

Now I think the way "probability" is frequently employed illustrates confusions similar to this one; propositions are sometimes believed to be validly inferable from propositions about probabilities when in fact such inferences are not justifiable in the light of the meaning, whether confused or not, ascribed to the term "probability." Hence, while I do not believe it is the philosopher's task to legislate away any of the meanings which "probability" may have, I think it is his task to *distinguish* between different meanings. It is also his task to evaluate the cogency of arguments which claim that propositions about probabilities are adequate premises for certain kinds of conclusions, and to suggest what the term *ought* to mean, and what it *could not* mean if the conclusions are to be valid consequences.

2. The second point I wish to make concerns the conditions for an empirically significant theory. Every theory is required to be formulated in such a manner that determinate propositions may be inferred from it by logical means alone. And furthermore, it is requisite that among the logical consequences of a theory there must be propositions which are capable of empirical corroboration or refutation. In brief, theories must be verifiable.

It will be obvious that no theory can be established beyond every

possibility of doubt by any finite number of observations. This is so because theories are universal propositions which are intended to express the constant relations between an indeterminate number of specific events, most of which lie in the future. But while the empirical evidence for a theory can never be complete, *some* empirical evidence there must be. This statement implies the proposition that not every state of affairs can be confirmatory evidence for a given theory, so that propositions about possibly observable states of affairs must be specifiable which would contradict the theory. Any theory for which this statement is not true is without empirical content. Laplace did not require God in his *Celestial Mechanics* to explain the motion of heavenly bodies, simply because the hypothesis of God leads to no consequences which are empirically refutable.

But a word of caution must be added. Not all theories are rejected simply because an observed fact seems to contradict some logical consequence of a theory. For any empirically testable consequence which is said to be drawn from a theory does not follow *simply* from the given theory. It follows from the theory *conjoined with* other theories and observational data. It is thus the whole system of our knowledge which is put to an empirical test. Hence an alleged contradiction between theory and observation can be eliminated by making suitable changes in other parts of the body of our knowledge, so that what was initially regarded as a logical consequence from the theory no longer is capable of being deduced from it. Nevertheless, while so-called crucial experiments for a theory are not finally decisive and are only relatively crucial, *in the context of a given set of assumptions* the propositions about possible observations which would contradict the theory must be determinate; in that context we must in principle be capable of deciding whether such propositions corroborate the theory or not. This methodological principle will be shown to play an important role in the discussion of the meaning of probability.

3. There remains one further point in methodology which I wish to make explicit. Every theory about a subject matter involves a selection of phases of behavior within that subject matter, and does not consider the interrelations of all its phases. Moreover, for various reasons, a theory will state only an idealized schema of the relations between the selected phases. These observations lead to the consequence that the confirmation of a theory by experiment is only approximate. Now the degree of approximation which must hold between the consequences of an acceptable theory and the observation propositions is not determined by the theory. The degree may vary for the different situations to which a theory is applied and may even be left unex-

pressed as a tacit rule of inquiry. It is important to note, however, that the degree of allowable approximation is determined by various material considerations, such as the purpose for which the inquiry is undertaken, the kind of activity which the theory is intended to coördinate and foretell, or the character of the instruments by means of which the testing is carried on. In some domains of research, the ideal pursued may be the development of theories for which the degree of allowable approximation progressively diminishes; in other fields the pursuit of such an ideal may be a fatal obstacle to the achievement of the goal of an inquiry. From the point of view of an outsider, the limit of allowable approximation is arbitrary, conventional and "subjective." If such a person were to refuse to accept certain allegedly confirmatory evidence for a theory on the ground that the approximation was not close enough, neither logic nor matters of fact could force him to do so. Such a person would simply refuse to abide by the rules of the game which that special science or special inquiry agrees to follow.

These remarks will be shown to bear upon the interpretation of the meaning of probability, because they are relevant for the interpretation of any symbolic operation which is performed within a theory. Mathematical physics, for example, differentiates and integrates certain functions representing the distributions of material particles; nevertheless, it is safe to assert that the mathematical conditions required for these operations do not obtain for the actual distribution of particles. Similarly, infinite series are employed to calculate magnitudes of various kinds, even though the objects which have those magnitudes would not be regarded as capable of physical decomposition into an infinity of parts. Such symbolic operations upon infinite and continuous manifolds must clearly be supplemented by stipulations about the degree of approximation within which experimental findings will be regarded as corroborating the theory. These operations are effective tools for dealing intellectually and in a generalized way with a set of otherwise unrelated problems; they are so many different *façons de parler* for formulating and translating the invariant relations between what is directly observable. They are not in general "literal" statements about a subject matter, so that some indication must be supplied concerning the extent to which empirical traits may deviate from the idealized schema so that the latter will still serve the specific objectives of an inquiry.

II

With these methodological principles in mind, I turn now to an analysis of the meaning of probability. Lack of time, to say nothing of lack of competence, does not permit an adequate survey of the in-

numerable contexts in which propositions about probabilities occur. I wish, however, to distinguish five broad types of contexts in which they do occur, consider three analyses of the meaning of the term "probability," and indicate the bearings of the above methodological considerations upon each.

Statements involving probabilities are to be found in (1) every-day discourse, (2) in the field of applied statistics and measurements, (3) within the context of physical and biological theories, (4) in the comparison of theories with each other for their respective degrees of probability, and (5) in the branch of mathematics known as the calculus of probability. Examples of each type of statement will appear in due course, in the discussion of the three major interpretations of probability with which I wish to concern myself. To these I now turn.

The first interpretation is the classic one, associated with the historical development of the mathematical theory of probability. It has been expounded with vigor by the English logician and mathematician De Morgan. According to him, the word "probable" refers to the state of mind with respect to an assertion for which complete certainty or knowledge does not exist. Hence the degree of certainty of a proposition, its "probability," is the degree of belief with which it is held. For certainty has degrees, and all grades of "knowledge," it is claimed, are capable of being quantitatively conceived. It is possible, therefore, to apply the calculus of probability to the degrees or strength of belief, if probability is defined algebraically as the ratio of the number of alternatives "favorable" to an "event" to the total number of equiprobable alternatives. The transition from this definition to the previous one is mediated by the principle of sufficient reason or indifference, according to which two propositions are equally probable if the strength of our belief is equally divided between them.

The second interpretation of probability is professed by certain English logicians like the economist Keynes. According to it, any two propositions are related not only by the relations usually studied in traditional logic, such as implication, but also by a directly intuitable relation called probability. This relation is not analyzable, although it is capable of having degrees. However, while any two propositions will each have some degree of probability with respect to a third, the degrees of probability are not in general comparable or measurable. Hence it is not always possible to apply the calculus of probability in order to explore the implications of compound assertions of probability relations. But whenever the calculus is applicable, the application is carried on in terms of a modified principle of indifference.

The third interpretation of probability is already implicit in Aris-

tcttle, but has become prominent only within the last century as a consequence of applying the probability calculus to statistics and physics. Its central idea is that by the probability of a proposition or an "event" is meant the relative frequency of the "event" in an indefinite class of events. A more precise statement of this view will be given presently. It is sufficient at this point to emphasize the fact that on this interpretation every statement involving probabilities is a *material proposition* whose truth or falsity is to be discovered by examining objective relative frequencies.

We must now decide (1) whether the meaning of propositions about probabilities in any of the five contexts I have enumerated is adequately stated by any one of these interpretations; and (2) whether any of these interpretations correctly analyzes the meaning of the propositions in *all* the five contexts.

Now it is demonstrable that statements involving the term "probability" which occur in the mathematical calculus of probability, in no way depend upon any of these interpretations. For the calculus of probability is a branch of what is called "pure" mathematics, a discipline whose sole object is to discover whether something follows logically from something else. The premises or axioms of the calculus, as a branch of pure mathematics, are not propositions but *propositional functions*, i.e. expressions containing *free* variable, as in the statement "If p, q, are the probabilities of two exclusive alternatives x, y, respectively, then the probability of x or y is p plus q." If we examine this and analogous statements and the operations of the calculus carefully, we discover that the term "probability" is a *free* variable, which is defined only *implicitly* by the axioms of the calculus. As far as the calculus itself is concerned, the free variable may be interpreted in *any* manner whatsoever consistent with the axioms of the system. It may even be possible to interpret the free variable "probability" in each of the three ways suggested above, just as it is possible to interpret the letters a, b, in the formula $a+b=b+a$, as integers, fractions, or complex numbers although these are three different sorts of numbers.

The calculus of probability does not therefore determine the specific empirical content of the term "probability" which occurs in its statements. Its axioms may of course be used to define implicitly what probability is, and thus limit the range of possible interpretations of the term. But its primary function is to enable us to discover, given certain initial probabilities, what other probabilities are implied by them. It therefore follows that the use of a so-called principle of indifference *within* the calculus to *define*, for purposes of supplying hypotheses for deductions, the alternatives which are to be treated sym-

metrically, does *not* justify the use of that principle as a criterion for *deciding* which material propositions are "equiprobable" in any non-formal sense of the word.

There thus remain for consideration four types of propositions involving the term "probability." Now I think that when some people assert propositions in every-day discourse, such as "It is very probable he read it in some book," "It is not probable that he could have forgotten me," or "The real existence of Christ is most probable," they mean by "probability" just what De Morgan says they mean. For when we inquire what sort of evidence is believed by these people as relevant for these propositions they can do nothing but reassert their beliefs; while the rapid variation in the degrees of probability which they attribute to propositions makes it plausible to assume that a degree of probability is in some way an index of the "intensity" of their convictions. Moreover, I also think that when some people evaluate theories with respect to their truth, for example when they declare "The theory of evolution is just as probable as the theory of special creation," it is a subjective interpretation which seems to be the correct one. However, those who consistently use the term in this sense assert propositions about probability which have no verifiable consequences, since the implicit predictions which they think are involved in their statements can in no way be justified as logical consequences from them. In spite of the efforts of De Morgan, Stumpf, and others to assign an interpretation to the numerical value of a "probability" when the latter is understood as strength of belief, no unambiguous criteria have been specified for the equality, addition, or multiplication of probabilities. They are therefore not entitled to employ the calculus of probability upon their interpretation of what probability is, because the fundamental operations of the calculus are without any specified content. And finally, this interpretation of probability is completely irrelevant for propositions in applied statistics or physics like "The probability of a male birth in the U. S. is .52," or "The probability of a 10° deflection of an α-ray passing through a film is $\frac{1}{4}$." As Norman Campbell remarked apropos of the last statement, if anyone proposed to attribute to that probability any value other than that determined by frequency, he would convince us of nothing but his ignorance of physics.

It has been claimed for the Keynes interpretation of probability that it is the only adequate one for most uses of the term. Thus, it is claimed that for propositions such as the following: "On the evidence as to their moral character, it is more probable that witness A speaks the truth than witness B," "It is probable that Miss C would have won the beauty prize if she had entered the contest," or "Relative to ex-

periment D the Einstein theory is more probable than relative to E," we must have a "rational insight" into the connections between the evidence and the conclusion said to be probable. For, it is alleged, in these cases the probability relation cannot be interpreted in terms of relative frequencies; for no numerical evaluation of the degrees of probability is possible since the relevant statistical information is completely lacking. Hence "probability" refers to a unique, directly intuitable relation between propositions.

I shall examine presently what a frequentist might say to this. I will admit, however, that probability relations are often asserted to hold on the basis of no specific statistical evidence such as the frequency interpretation seems to require. But I do not think this *proves* the existence of such a unique relation of probability which can be "rationally" intuited. In the first place, there are few people who claim for themselves the requisite intellectual faculty for intuiting these unique relations. In the second place, the alleged intuition is not controllable, and there seems no way of corroborating its findings. For the alleged unique probability relation is not definitely localizable, so that agreement both about its presence and degree cannot be obtained among competent students. And in the third place, on Keynes' view a degree of probability is assignable to a *single* proposition with respect to given evidence. But what *verifiable* consequences can be drawn from the statement that with respect to the evidence the proposition that on the *next* throw with a given pair of dice 7 will appear, has a probability of 1/6? For on the view that it is significant to predicate a probability to the single instance there is nothing to be verified or to be refuted. Hence Keynes' view, like that of De Morgan, violates the principle of verifiability required for all statements, and cannot be regarded as a satisfactory analysis of probability propositions in the sciences which claim to abide by this canon.

III

We must therefore examine the frequency interpretation of probability, to discover whether it offers an adequate account of the types of probability propositions I am considering and whether it is free from the objections which are fatal to the alternative interpretations. It seems to me, however, that the views of De Morgan and Keynes are correct in insisting upon two points, so that a frequency interpretation must be so formulated as to include them. The first is, that probability is not a property of facts or events, but of propositions. It follows that the analysis of the meaning of probability and the consideration of the evidence for probability propositions belong to logic, not to physics or

metaphysics; and indeed I think that at no point in that analysis or consideration is a prior decision required about the universality of causal determination or the presence of absolute contingency. Thus, when we seem to talk about the probability of an event we are simply talking inaccurately although conveniently about the probability of a proposition stating the occurrence of that event. The second point is that probability is not a property of a *single* proposition, but is a relation between propositions. A proposition is either true or false, and is not, as such, probable; it is probable with respect to other propositions. It seems to me, therefore, that a frequency view will not quarrel with Keynes on the ground that "probability" refers to a relation between propositions, but only on the ground of what *sort* of relation it is.

The chief difficulty for the frequentist is to find a formulation for his view, or at least an interpretation of a formulation, which will make it adequate for the sort of situations where it is fairly clear that frequency considerations are relevant. I wish to consider the following one.

Let C_1 be a characteristic, e.g. being a coin with usual shape and construction tossed in the usual way, and C_2 be another characteristic, e.g. falling heads uppermost. Then "x_i is C_1," "x_i is C_2" and "x_i is C_1 and C_2" are propositional functions whose values are propositions, true or false, when constants are substituted for the variable x_i. Let T_i^n (x_i is C_1 and C_2) be the number of true propositions obtained when the constants replace the variables in the respective propositional functions, where n is the total number of propositions obtained in this way; and let $T_i^n(x_i \text{ is } C_1)$ be interpreted in a similar manner. Finally, form the fraction $F_n(C_1\ C_2) = T_i^n(x_i \text{ is } C_1 \text{ and } C_2)/T_i^n(x_i \text{ is } C_1)$, which will be the numerical value, in n cases, of the relative frequency with which propositions of the form "x_i is C_2" are true. If, now, the fraction F_n approaches p as a limit as n increases without limit, p will be called the probability with which, to speak loosely, a coin falls heads on the evidence that it is "fairly" constructed and "fairly" tossed.

This definition of "probability" incorporates the two important insights of the alternative interpretations already discussed, and adds a feature which they neglect—namely, relative frequency. Consequently, on this "truth-frequency" view, probability is a relation between propositions, but an *analyzable* relation; secondly every statement predicating probabilities is a *material* proposition for which empirical evidence is required; and thirdly, probability denotes a relation between *classes* of propositions, so that a statement about the probability of a single proposition is an elliptic way of asserting a relation between classes of propositions to one of which the given proposition belongs. Since proba-

bility is a fraction, addition and multiplication of probabilities are given intelligible meanings. A calculus of probability may therefore be employed to calculate from certain initial probabilities of propositions the probability values of other propositions related in definite ways to the given data.

I shall take for granted, what is generally admitted, that in such contexts as vital statistics and physics a frequency interpretation for propositions about probabilities is the relevant one. But this discussion of the meaning of probability would be sadly incomplete if I did not touch upon the question whether the formulation of a frequency interpretation I have reported is capable of meeting the serious objections which have been leveled against it. To these objections I now turn.

1. It has been argued that we cannot define probability as a limit of a ratio in the mathematical sense. For if the probability of a proposition *were* such a limit, there would have to be a term in the series studied, *after which* the difference between the limit and the relative frequency empirically found would be less than any preassigned magnitude. But if there were such a term for a given preassigned magnitude, it would follow necessarily that the empirical frequencies could not deviate from the limit by more than this magnitude. This, however, contradicts well established theorems in the calculus of probability.

This objection seems to me to have a point only when we are dealing with what by some writers are called "normal" series, to which alone Bernoulli's theorem is applicable. It loses all force for a series which exhibits a certain kind of internal regularity, e.g., the series of numbers 1, 0, 1, 0, 1, 0, etc. In the second place, as Von Mises has shown, for "normal" series the objection fails to distinguish between the probability that a certain sequence of events will *occur* in a given series and the probability that such a sequence of events will occur at a *definite place* in a series. The latter probability involves not one series but a *whole class* of them, so that a whole set of preassigned magnitudes is required and not only one such magnitude. But in the third place, whatever force the objection has is directed against the dialectical elaboration of probability in terms of the calculus of probability. Now the limit definition of probability is required to develop such a calculus consistently and at the same time to find a way of formulating empirical frequencies so as to be amenable to convenient calculation. Nevertheless, as has already been indicated, the definition has to be supplemented by indicating the degree of approximation which would be allowed in practice between the empirical frequencies discovered and the theoretical limit stipulated. As long as the empirical relative frequencies remain within approximately assigned intervals, it is con-

venient to select *one* of the values which the empirical ratios take on within this interval, and to treat it, for the purposes of calculation, as the mathematical limit of the ratios. This assumption is permissible because it leads to no contradictions, and is advisable because of the dispatch it introduces into the mathematical operations. Since the range of allowable oscillation of the ratios is agreed upon on extra-logical grounds, the range as well as the limit may both be altered with the progress of inquiry. Hence even apart from the acute observations of Von Mises the alleged contradiction could always be obviated by conveniently altering the value of the limit. I think therefore that one virtue in this objection consists in calling our attention to the conventional moment in the value assigned to a probability.

2. A second objection is directed not only against a limit definition of probability, but against *any* frequency interpretation of the term. I shall state it, however for the limit definition. How can we ever discover the probability value of a proposition on given evidence, it is objected, if this value is defined as the limit of an infinite sequence of ratios? For we do not, in general, know the law of the sequence, and we can never examine more than a finite number of its terms. Hence the value of a probability is a sort of "unknowable," so that this definition of probability cannot be a correct analysis of what we mean in making judgments of probability.

A two-fold answer may be offered: In the first place, while it is true that we can examine only a finite number of terms in an empirical series, we can employ the empirical ratios as hypotheses for the "true" probability value of the infinite series. These hypotheses are to be tested in the usual way, by comparing their logical consequences with the ratios subsequently observed empirically. And in the second place, a probability value may be deduced from some general theory already established, instead of being obtained from observation of a statistical series. For example, the probability of a "fair" coin falling heads uppermost may be computed by the aid of theoretical mechanics, although in this case the calculated probability is once more a hypothesis to be tested by empirical frequencies.

Before elaborating these answers I think it is necessary to note an important objection that is made to both of them. Suppose we entertain the hypothesis that the probability of getting a head with a coin thrown in the usual way is $\frac{1}{2}$. This hypothesis must then have determinate consequences, in accordance with the principle of verifiability discussed above. But suppose that in a thousand throws heads turn up 900 times. Has the hypothesis been refuted? It is well known, however, that this empirical result is not incompatible with the hy-

pothesis of $\frac{1}{2}$ as the probability, since, indeed, this hypothesis requires us to expect it; for that hypothesis means simply that in an *indefinitely* long series the proportion of heads will be approximately $\frac{1}{2}$, and does not therefore exclude a preponderance of heads within a finite segment of the series. It seems, therefore, that the hypothesis of $\frac{1}{2}$ as the probability, like the hypothesis of a Providence, has no *refutable* consequence, and is without empirical content. It is no answer to this observation that no hypothesis can be *completely* verified. For the criticism doesn't challenge the hypothesis of $\frac{1}{2}$ as the probability on the ground that it is not capable of *complete* confirmation, but on the ground that, in terms of the hypothesis itself, it does not seem capable of refutation no matter *what* the empirical findings are.

It seems to me, however, that this objection is fatal only if the frequentist fails to introduce the degree of allowable approximation into his predictions. For it is obvious that in practice we do decide, on the evidence of empirical frequencies in final series, whether the assumption we have made as to the value of a probability is corroborated or not. Thus, if a coin were thrown a thousand times and the head came up 490 times, we would regard this as supporting the hypothesis that the probability of its coming up is $\frac{1}{2}$, where the hypothesis has been suggested by observing other finite series of throws; if it came up 520 times we would usually still regard this as confirmatory evidence; but if it came up only 400 times we would normally reject the hypothesis, suspect the coin was loaded, and propose a different value for the probability. We proceed in this manner because we have in mind a degree of allowable approximation, in this case lying somewhere between a deviation of twenty and one of a hundred. That we do not always explicitly define this degree is not important. We cannot specify this degree once for all, since it is a function of the specific context in which the coin is thrown. What is important, to my mind, is that there is a tacit acceptance of *some* degree of allowable deviation, however vaguely we may formulate it to ourselves.

But I think something further can be said about the way the specific context of inquiry controls this degree of allowable deviation, and about the way in which the testing of hypotheses about probabilities is conducted. Propositions about probabilities are not isolated propositions in the body of our knowledge. The evidence for them comes not merely from an examination of statistical frequencies, but also, and sometimes exclusively, from various theories and other data. Consequently, in the above case, if we have reason to believe that the coin is not loaded and is "fairly thrown," in any finite segment of an endless series a larger degree of deviation from the hypothetical frequen-

cies will be allowable than if we did not possess this information. On the other hand, if a man is gambling with a limited amount of money, he will generally impose a smaller degree of permissible deviation from the hypothesis he entertains for the relative frequencies. Thus, although we cannot fix once for all the number of throws within which the hypothesis about the probability would be taken as sufficiently corroborated, in practice such a number is roughly indicated.

It must also be stressed that the method of rational inquiry is a self-corrective one, and in general we place greater reliance upon our rules of procedure and "long-run" results than upon particular conclusions obtained. Thus, suppose that in the case where we obtain 400 heads out of a thousand throws with a coin we are led to entertain the hypothesis of 2/5 for the probability of getting a head. It may be the case that for this particular coin the "true" probability is in fact $\frac{1}{2}$, so that the hypothesis of 2/5 is false. Nevertheless, it would not be irrational to adopt the latter hypothesis in this instance, if it were the case that when we continually formulated hypotheses on evidence in the manner indicated, we did hit upon a good approximation to the relative frequencies more often than not. Indeed, while we are not in the position to assert that the empirical relative frequencies do approximate to a limit, nevertheless *if* they do we are bound to discover this approximate value by a repeated and systematic correction of the hypotheses suggested by the empirical samples we continue to examine.

IV

According to the frequency interpretation of probability it seems as if we ought to be able to associate a definite numerical value with every statement about probability. But it must be pointed out that the evidence for statements of probability may often be inadequate, because both statistical and theoretical information may be lacking. In such while it still may be true that what we *mean* by probability is stated by the frequency view, for lack of relevant evidence we rely on general impressions and "hunches." Thus, for the proposition "It is probable on the evidence that witness *A* speaks the truth," we do not possess any means for assigning a definite numerical value to the probability. It does not follow, however, that a frequency interpretation is illegitimate. For what may be meant by this statement is that the relative frequency with which a regular church-goer tells lies on important occasions is a small number considerable less than $\frac{1}{2}$. For many purposes we do not require an actual numerical value for the probability, since in some contexts an indeterminate value which is greater (or less) than

$\frac{1}{2}$ is sufficient; and although we may lack adequate statistical material to support such statements, we may nevertheless possess considerable general experience to corroborate them. In these contexts I would admit that the more precise formulation given above is not a good picture of the meaning of probability statements; and that a frequency interpretation is satisfactory only if we take care not to define probability too rigorously.

Nevertheless, in the light of the preceding I think it is at least plausible that in the first three contexts enumerated earlier, a frequency interpretation of probability is a workable one, although whether it is satisfactory for any given instance of a probability proposition can be decided only by examining the instance itself. The remaining question I wish to touch upon is whether statements about the probability of theories can also be interpreted in the frequency sense.

Since statements about the probability of a proposition are material statements for which, in the light of the preceding, the evidence must be judged as incomplete, such statements are hypotheses about the probability in question. It is therefore not surprising to find statements like the following: "It is probable that the probability of getting heads with a coin is $\frac{1}{2}$," and it is natural to ask whether in the first occurrence of the term "probable" means the same as in its second occurrence.

There is a way, I believe, in which both occurrences of the term "probability" in this statement can receive a frequency interpretation. Suppose there are an indefinite number of coins a, b, c, etc., for each of which we seek the probability of getting heads by repeated tosses; we then would obtain a theoretically endless "square array" of propositions. Suppose further that after say a thousand trials with each coin, we formulate the series of propositions: "The probability that coin a falls heads is $\frac{1}{2}$," "The probability that coin b falls heads is $\frac{1}{2}$," etc. Each proposition is a hypothesis about the respective coin, and requires to be tested in the usual ways. Now suppose some of these hypotheses were confirmed by continuing the series of throws with the corresponding coins and some were not, but that nevertheless the ratio of verified hypotheses to the total number exceeds $\frac{1}{2}$ say. We may express this by saying that on the evidence that these hypotheses have been tested to the extent indicated, the statement: "The probability that coin x falls heads is $\frac{1}{2}$" where x is *any* coin, has a probability greater than $\frac{1}{2}$. It seems to me, therefore, that in *some* cases where hypotheses are said to be probable, it is possible to interpret the probability of hypotheses in a frequency way.

But is it *always* correct to interpret such statements in this way? I think there are several cogent arguments for denying this.

1. It is possible to interpret the probability of *singular* propositions, like "This coin falls head uppermost" in a frequency manner, because singular propositions are *values* of propositional *functions* and because we can define the expression "the truth-frequency of a propositional function." But, it is urged, we cannot in general regard a theory as a *value* of some propositional function, and in any case we cannot attach a clear sense to the expression "the truth-frequency of a propositional function for which a theory is a determinate value." For consider such a complicated theory as Newtonian mechanics. Is it possible and is it practicable to regard this theory as some value of a propositional function? And is it really helpful to talk about the truth-value of this theory in any sense analogous to the way in which we discuss the truth value of the proposition "This coin falls heads uppermost?" It will follow that if the answer to these questions is in the negative we cannot assign a frequency meaning to a statement that the Newtonian theory is probable on given evidence.

2. It is sometimes thought that we can assign a numerical and therefore a frequency probability to a theory under the following circumstances. On the hypothesis that theory A is true the probability of an empirically confirmed proposition p is 1; on the hypothesis that theory B is true, the probability of p is $\frac{1}{3}$. Hence, it is claimed, A is three times as probable as B on the evidence that p is true. But this argument must be rejected by a frequentist on the ground that it uses Bayes' theorem in the form in which it tacitly employs the assumption that the *antecedent* probabilities of A and B are equal. Such an assumption is incompatible with the central thesis of the frequency view. The most that a frequentist can claim is that by adopting theory A he is employing a system of inferences which would lead him, *via* the theory, to empirically false conclusions not oftener than approximately once out of three times.

3. This last remark may be thought to provide a clue for interpreting in a frequency way the probability of theories. It has been suggested that such statements mean that the logical consequences of a theory which may be approximately confirmed by experiment are true with a certain relative frequency for the series of *all* the logical consequences of the theory capable of experimental testing. This suggestion, however, does not seem to be a way out, for according to it we would say that the probability of the Newtonian theory is 4/5 if every fifth consequence of the theory were materially false. But in such a case the theory would ordinarily be rejected as false, and not accepted as highly probable.

4. And finally, it may be urged that what we mean by the proba-

bility of a theory is the ratio of its *actually* verified consequences to the total number of its *possible* consequences. In general, however, since this ratio would have the value zero, this cannot be taken as the measure of the probability of a theory.

It seems to me therefore that in general statements about the probability of theories do not refer to relative frequencies in any obvious way, although for some theories which are not too complex it is possible to provide a frequency interpretation for propositions about their probabilities. I do not see in what way it is possible, or for that matter in what way it would be useful, to compare, say, the "probability" of the gene theory in genetics on the evidence for it, with the "probability" of the relativity theory on the evidence for the latter, although on a frequency interpretation such comparison should be significant. I do not reject the frequency interpretation for statements about the probability of theories, as is sometimes done, on the ground that there is an essential difference between universal and singular propositions because of an alleged difference in the logic of verification required for them. Nor do I believe that the acceptance or rejection of a theory is a completely arbitrary matter, or that the evidence for one of two alternative theories may not be more complete or satisfactory than for the other. This is a matter which requires an independent study, and would lead, I think, to another meaning of the term "probability" into which frequency considerations enter in ways different from the way they enter the frequency view here discussed. But I do think that it is not very illuminating to place the interpretation of all statements about the probability of theories upon the Procrustean bed of the frequency view I have considered. For while there are certain rough analogies between the way the term "probability" is used in the context of statements about theories and its use in other contexts, the differences in this case seem to me to outweigh the similarities.

I conclude, therefore, that the term "probability" is not a univocal term, for it has different meanings in different contexts. However, the frequency interpretation, when properly qualified, seems to be the most satisfactory one for analyzing the meaning of the term in the contexts of every-day discourse, applied statistics and measurement, and within many branches of the theoretical sciences. Furthermore, some statements about the probability of hypotheses can be interpreted in a frequency manner; but I do not find sufficient grounds for maintaining that such is the meaning of probability in statements about the probability of complicated theories like the corpuscular or wave theories of light.

DISCUSSION*

After an impartial survey of the various contexts in which the term probability is used, the speaker reaches the conclusion that the frequency interpretation is the most satisfactory in rendering the *central* meaning of the term. This result, arrived at from the avenue of methodological analysis, must be pleasing to those who are accustomed to handling probabilities in practical calculations, for they almost invariably acquire the attitude that the only *possible* meaning of probability is the statistical one. While this position is doubtless dogmatic, it has been strengthened enormously in recent years by a new development of physical thought to which Professor Nagel has indirectly referred in his allusion to theoretical physics. I mean the subject of quantum mechanics. It seems to deserve a place in the discussion of probability because it renders the statistical or frequency point of view well nigh universal.

If the fundamental thesis of quantum mechanics is correct, *all* physical observations form a probability aggregate, that is, a set of data to which the probability calculus can be applied. The essential difference between this physical doctrine and the older statistical theories lies in the claim to universality made by quantum mechanics. For, while the older theories admitted their incompetence in large fields of physical thought, such as dynamics and electromagnetism, quantum mechanics shows signs of success in handling *all* physical phenomena. And if, as is frequently supposed, the data of all exact empirical sciences are basically physical, we are confronted with the possibility that the entire physical world ultimately resolves itself into a set of events joined merely by the rules of the probability calculus. The interesting point in this connection is that quantum mechanics *requires* the frequency interpretation of probability, and therefore imposes it on physical experience in general.

To give a definite physical example let us consider any system, say, an atom of hydrogen. All that we can possibly know about it is summed up in the specification of its state function. Being in possession of all the elements of knowledge which describe its state, we are nevertheless in general unable to say with precision what the value of its energy content in a single observation will be. The only feature capable of prediction is the relative frequency with which each possible energy value will occur. There is no sense in which a probability statement of this sort can be connected with the views of De Morgan or of Keynes.

It must be admitted, of course, that arguments like the preceding, which dwell on the mere prevalence, however general, of a single probability interpretation do not in strict logic rule out other meanings if they occur in scientific discourse. However, they do raise the question as to the desirability of reserving the word probability, in its technical usage, to express those ideas which it seems most generally to convey. I do not suggest that phrases like "it will probably rain tomorrow" should be banished from refined discourse. But it might well be a gain if logicians, by common agreement, were to take the same attitude toward such phrases as the physicist does toward the wholly proper common application of the term work. Words are but tools which may be handled in different ways according to the results desired, but when a definite purpose is to be achieved, their use should be definite and unequivocal.

According to Professor Nagel, a probability is the limit of the relative frequency with which a propositional function is true. I should like to ask the

* Condensed from the prepared discussions of Professor Nagel's paper.

speaker if he regards this formulation as complete. Since it makes no reference to any particular *order* in which the constants are to be substituted into the propositional function it permits their arrangement at will. Thus, in the simple case of the alternative of heads and tails, one might arbitrarily select all tosses which appear heads uppermost. But as we assume the availability of an infinite number of these, the limit of the relative frequency of heads would be one. If, on the other hand, we had chosen regularly two heads and then one tail, as is perfectly feasible, the probability would have been $\frac{2}{3}$.

The trouble here has nothing to do with the mathematical existence of the limit; the difficulties encumbering that point have in my opinion been adequately resolved by the speaker. It arises from the fact that the truth formulation of the frequency theory presupposes merely any sequence of propositions, but not an ordered sequence. It admits sequences with too much internal regularity, like alternations of heads and tails, or arrangements like the recurring decimals of the fraction $^1/_7$. Such aggregates are foreign to probability rules, as would be intuitively clear to any one confronted with the task of defending such a sequence as the result of a game of chance. What we encounter in actual practice is usually *not* a set of propositions devoid of arrangement, but an ordered set of events, in connection with which *frequency* means *frequency of occurrence* (rather than of truth). If now we augment the probability definition, as given, by the statement that the limit shall be insensitive to a "blind" selection of elements from the set, it becomes complete. By blind selection I mean the following: Starting with the ordered sequence, we select elements by a *preassigned* rule, that is by a rule which does not regard the property of the element in question. For instance, from the aggregate of tosses of a coin, we might select every second throw, or every throw whose ordinal number is a prime, but not every third head, etc. We then demand that the aggregate formed from the elements thus selected shall possess the same limiting values of the relative frequencies. If this demand is satisfied, we speak of probabilities.

Now, with this detail out of the way, it seems profitable to survey the various probability interpretations in the light of the question: When does a quantitative application of probability notions lead to correct answers, and when does it not? In other words, upon what type of aggregate (propositions or events) may one legitimately operate with the probability calculus? Closer examination would show that only a frequency theory can give the answer, and the answer would be that just outlined. It is obvious, therefore, that any theory which identifies probability with truth value or intensity of belief labors under a two-fold disadvantage: first, it is incapable of specifying quantitative probabilities at all, as was clearly shown by the speaker; second, it is incompetent to name the conditions under which it may legitimately proceed. The last statement means that unless one adopts a frequency point of view, one is unable to tell when the quantitative use of probabilities will land one in error.

Since the use of probabilities in connection with *theories* is not interpretable on the basis of a frequency view, and is therefore subject to uncontrollable fallacies, I should simply urge that this usage be regarded as unscientific. Perhaps substitution of the term "truth value" in that context might be recommended. Or else one might distinguish between "probability of truth," whatever truth may mean in a given connection, and "probability of occurrence."

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Professor Nagel proposed to define probability in terms of frequency. The question arises, however, whether, in terms of frequency, any meaning can be assigned to the expression "the probability of an event that occurs only once." Suppose, for instance, that my life hangs on my answering correctly the question whether the card which I now draw from a pack is a spade or is not a spade. It would commonly be said that *that particular drawing* will *probably* not be a spade. But to say that "probably" here means that if *several* drawings were made, the cards drawn would, more frequently than not, be other than spades, is, in effect, only to predict what would occur *if not only that one* drawing, but *several* drawings, were made; and this seems clearly irrelevant to the question what probability means when *that one drawing only* is referred to. And to say that we are able to speak at all of the probability of that drawing only in so far as that drawing is representative of a class is only to raise instead the question what it means, to say that *that one* particular drawing *probably* is representative of a class 3 out of 4 cases of which, on the average, turn out not to be spades,—a question which seems no easier to answer in terms of frequency.

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The frequency interpretation of probability, as Professor Nagel has shown, appears to be the most satisfactory one in most of the senses in which the term is used. However, there are situations in which statements to be made involving uncertainties seem to require a logical approach different from that of a straightforward application of the notions of classical probability. Consider, for example, Professor Nagel's discussion of the statement: "It is probable that the probability of getting heads with a coin is $\frac{1}{2}$." I cannot agree with his frequency analysis as a solution of this problem. If the possibility of a continuum of values of the probabilities in the neighborhood of $\frac{1}{2}$ is admitted it appears paradoxical that he should arrive at the conclusion, "'The probability that coin x falls heads is $\frac{1}{2}$' . . . has a probability greater than $\frac{1}{2}$." This means that the probability is greater than $\frac{1}{2}$ that a number which can take on a continuous range of values will take on a preassigned value. The difficulty is not in the meaning of the "probability of getting heads," but in the frequency interpretation of the *probability* of the "probability of getting heads." This problem seems to depend on a procedure for its solution different from that of a direct application of classical probability theory. In view of recent advances in uncertain inference by R. A. Fisher, J. Neyman, E. S. Pearson and others, a more satisfactory analysis and solution of this problem is as follows:

Assume the true probability of getting heads with a given coin to be p. Of n tosses of the coin suppose m are observed to be heads. By deductive methods, the probability of getting m heads is found to be $\{n!/m!(n-m)!\}p^m(1-p)^{n-m}$. We now devise a function F of m and n and associate values which F can assume, with intensity of tenability, or degree of confirmation of the hypothesis that p is the probability. To effect this association, we must have some method of estimating p from m and n, since, in this problem, we are inferring the value of p from the data m and n. The estimate which is made of p must satisfy certain self-evident conditions, among them being that it must have an expected value equal to p, and it must estimate p with minimum error. A method which satisfies these conditions and certain other important ones is furnished by the method of maximum likelihood. Once we have found F, which, in this example, can be taken as $x=m/n$, the optimum estimate of p, we make the hypothesis that p is the

probability and by the classical theory of probability we find how the probabilities associated with the various values of F will be distributed. We now choose a set S of possible values of x such that the sum of their probabilities of occurrence is a preassigned number ϵ; then if x falls in S we reject the hypothesis that p is the probability. The actual determination of S is made in the light of alternative hypotheses. It is selected on the principle that, in the long run, we should reject our hypothesis in not more than a fixed percentage ($100\epsilon\%$) of cases when it is true, and that we should accept it as seldom as possible when it is false (that is, when one of the alternative hypotheses is true). For the given number ϵ and for each value of p, we find the largest x_1 for which the probability that $x \leqq x_1$ is less than or equal to $\frac{1}{2}\epsilon$; likewise the smallest x_2 for which the probability that $x \geqq x_2$ is less than or equal to $\frac{1}{2}\epsilon$. Then if x falls in the region between x_1 and x_2 corresponding to a given value of p, this may be declared confirmatory evidence for the given value of p. Otherwise, p will not be accepted as being a tenable value of the probability of the coin falling heads. If we take the region generated in the p-x plane by taking the interval from x_1 to x_2 for all values of p from 0 to 1, we have an area called a "confidence belt" with a "confidence coefficient" of $1-\epsilon$. From the given data m and n there will be formed a certain value of x, say x_0, and there will be a set k_0 of possible values of p such that if p is any member of k_0, then x_0 would be in the region of confirmatory evidence; if outside, x_0 would be classed as contradictory evidence with confidence coefficient $1-\epsilon$. Since the probability that x should be in the region of confirmatory evidence is $1-\epsilon$ (for any given value of p), we can make the objective statement that a given value of x will be confirmatory evidence for any of our admissible hypotheses in which p has a value in k. We can condense the statement to the following one: If $m/n = x$, the *fiducial* probability is $1-\epsilon$ that p has a value in k. This is not probability in the classical sense at all, but it seems to be an adequate technique for making inferences about the value of p from those of m and n. The method is somewhat more general and can be applied to problems involving regression coefficients, variances, etc. The important thing to be observed is that we have adopted a rule in which we invariably reject the hypothesis in a certain proportion of cases in the long run, but have chosen the confidence belt so as to minimize the error of rejecting the hypothesis when it is true by maximizing our confidence that one of the alternative hypotheses will be true when the hypothesis is rejected. There is a certain amount of classical probability in the process but it appears more as a tool than as the essence of the method. In the more complicated hypotheses in which inferences are to be made relative to several quantities simultaneously the confidence belt idea is still to be explored. A procedure based on the principle of likelihood has been developed for the more complicated hypotheses which are essentially what Professor Nagel has called theories. As Professor Nagel has implied in the last two paragraphs of his paper, the structure of the argument for making inferences concerning the truth of the more general hypotheses, or theories, cannot be a direct probability argument in the classical sense. As far as the theory has been developed at present, it appears that such an argument would have to proceed along the general lines outlined in the simple coin-tossing problem.

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SOME USES OF STATISTICS IN EXECUTIVE CONTROL*

By F. Leslie Hayford
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I shall take the term "executive control" to mean the continuous application of directive and regulative decisions and acts to the managerial phases of a business. Executive control is concerned with both the determination of policies and the fulfillment of administrative functions within the framework of the policies established. Both require constant attention to what is happening within the business itself and also outside it, in order that the changes and adjustments which continually become necessary may be made intelligently, promptly, and with coördination.

The concept of executive control as involving never-ending watchfulness, study and analysis, leading to appropriate decisions and actions,—this concept is the one upon which the following discussion is predicated. Business is, and must be, carried on from day to day in a changing environment, each day bringing its particular problems and requiring its minor or major adjustments.

Now, viewing executive control from this realistic, if somewhat prosaic, point of view, what are some of the uses of statistics in such control? To illustrate them by covering a variety of business fields would be impossible within the limits of this paper. It therefore seems best to consider a single field in one industry.

In the automobile manufacturing business the scheduling of production obviously is a problem of prime importance. This problem is complicated by the impossibility of predetermining how many automobiles the public will buy in the course of a given year. Furthermore, no manufacturer can forecast accurately what proportion of the total business he will obtain. The history of the industry records frequent changes in the overall rate of demand and in the relative attractiveness to the public of the various makes of cars, not only from year to year but even within a single year. Clearly, therefore, there is unavoidable uncertainty as to what any manufacturer's ultimate production requirements will prove to be for any model year. Moreover, an automobile manufacturer does not produce a single, standardized product. He must offer the public cars in various body types and colors, and

* Revision of a paper delivered at the Ninety-seventh Annual Meeting of the American Statistical Association, New York City, December 31, 1935.

usually in more than one wheel base size; and the consumer demand for these various combinations of wheel base, body type, color, etc., is unpredictable very far in advance.

The problem of scheduling production is further complicated by the fact that research is continually resulting in improvement of the product and that annual model change is the practice of the industry. The number of cars produced by a manufacturer during the model year must not be allowed materially to exceed or fall short of the number the public will buy at a price which will return a profit. An insufficient supply to meet the consumer demand means a loss of business, while any stock remaining on hand when new models are introduced becomes unsaleable except at a considerable reduction in price.

But there are other important purposes to be achieved by effective production regulation than merely the manufacture of the right number of cars during the model year. To secure the greatest practicable utilization of equipment, to maintain the quality of the product, and to extend the maximum annual earning power to the mass of employes, it is necessary to have as nearly level a rate of factory operations as is feasible and to keep as nearly constant a labor force as possible. Clearly however, there is no way of crystallizing the problem of so regulating production and employment and of affording a definite basis for administrative planning to that end, unless there is maintained at all times an ultimate production requirements figure to tie to. This does not mean, however, that such a figure ordinarily can be established at the beginning of the model year and be allowed to stand unchanged throughout the year, since an estimate of consumer demand made at the beginning of the year can only be a provisional one.

If the ultimate requirements could be known, the attack on the problem would, of course, be greatly simplified. Inability to know them accurately, however, does not remove the necessity of applying the best judgment possible and arriving at the most reasonable estimate or assumption which can be made. Although the figure arrived at may, and almost inevitably will, have to be modified from time to time during the model year, as the indications of the size of the consumer demand become clearer, such a figure must constantly be kept in mind and conscientiously applied, if the interrelated problems of production, employment, and utilization of equipment are to be dealt with in a reasoned and commonly understandable way. Without such an estimate of the production requirements for the model year, no one could judge the relation of a proposed current rate of production and employment to the probable subsequent average rate. And unless changes are promptly made in the estimate, as statistical and other evidence

indicates the erroneousness of the figure, the changes which eventually will have to be made in the rate of production and employment will be magnified.

Constant vigilance therefore is necessary, in order to detect as quickly as possible changes in the seasonally adjusted rate of consumer demand, so that needed changes in production schedules may be made promptly. But how can the rate of consumer demand be gauged? Obviously the first step must be the collection and tabulation of statistics of the sales of cars to consumers. In the earlier years of the industry such statistics were not available. Since 1922, however, the several car divisions of General Motors have been obtaining from their dealers regular ten-day reports of actual deliveries of cars to consumers and of stocks in dealers' hands, and since 1924 these data have been constantly used in an endeavor to effect intelligent regulation of production and employment.

The measurement of the seasonal variation of car deliveries to consumers naturally has been an important statistical problem. Year after year, as additional data have become available, this problem has been reviewed anew in an effort to arrive at more accurate seasonal variation indexes. As time has gone on, occasional sharp fluctuations have appeared in the deliveries figures, which quite obviously were not caused by either seasonal or cyclical influences but were due to other causes. These movements almost invariably have been attributable to some known special condition, such, for example, as a retail sales campaign, a price reduction or a price increase, or a shortage of cars in the field. Naturally, in the periodic reviewing of the question of seasonal variation, these special, peculiar movements have been discounted or actually thrown out of the statistical series when calculating revised indexes of seasonal variation.

It became apparent that human memory could not safely be trusted to recall at future dates the causes to which these peculiar movements were attributable. The practice was therefore begun of keeping a brief chronological record of the events or special conditions which were known or believed to have distorted the deliveries data. We were convinced that it was not enough to know what the statistics said, but that it was necessary also to understand as clearly as possible why the statistics said what they did. So we have tried constantly to question the data, asking why? why? This query, of course, has involved the recurrent question, how good are the data themselves?

In addition to periodical reports of deliveries of new cars to consumers, which are now obtained by all the principal automobile manufacturers from their dealers, the industry has had available since about

1925 comprehensive data of the monthly registrations of new automobiles, not only for the United States as a whole but for the several states and counties. These data are obtainable for individual makes of cars and even for some separate model series of the same make. From such data it is possible to make price group analyses and to ascertain month by month what proportion of the registrations of each price group is obtained by each make of car in that group. The manufacturer is thus able to see what changes are taking place in his competitive position and to ascertain how consumer preference may be shifting from one price group to another.

As I have already indicated, a continuous problem of estimating the size of the model year's consumer demand for the particular product is involved in the problem of scheduling production so as to maintain as nearly level a production rate as is feasible and to keep as constant a labor force as possible. A far from satisfactory production and employment condition may be rendered unavoidable by important unforeseen changes in consumer demand for the particular product; but the effects of such changes upon production and employment would be worse if there were not this constant endeavor to gauge consumer demand and to detect changes in its rate promptly, and if production scheduling did not concern itself with the requirements for the model year as a whole.

In dealing with this continuous problem of estimating future consumer demand, statistics and statistical methods have a highly important place, but they are not the sole determinants. A variety of non-statistical factors also must be considered. The executive who has intimate knowledge of the industry and of the particular business within the industry, who knows the quality of the dealer organization handling the product, and whose day to day experience has given him a sensitiveness to changing conditions, will be likely to use the statistics more intelligently and to greater advantage than one not so endowed and so experienced. If in addition he acquires an interest in the statistics themselves, in their quality and treatment, they will have a fuller meaning and a greater usefulness for him. One of the most important uses of statistics in executive control, therefore, is the frequent, regular examination by the executive of pertinent statistics which he either understands thoroughly or about which he is willing to make himself thoroughly informed. There are such executives, and, in dealing with them the statistician does not indulge in elaborate, carefully qualified reports, but sits down as with another intelligent (but not too technical) statistician and talks things through, gaining as well as giving enlightenment.

This discussion of what is popularly termed production control has had two purposes; namely, to illustrate some of the kinds of statistics required, and also to bring out the fact that problems of executive control are in the main constantly recurring ones—problems primarily of frequent, prompt adjustment—rather than occasional great and dramatic problems, culminating in the necessity for some piece of masterly strategy or epoch-making planning. As Arch W. Shaw said years ago, "business changes too quickly for the solution of to-day to be of much service to-morrow."

In the automobile industry, and in other industries as well, the most carefully and conscientiously made estimate of the year's production requirements must be subject to recurrent modification, and the scheduling of production and employment accordingly requires frequent minor or major readjustment. The greatest use of statistics in executive control in this field will therefore be in helping promptly to detect and understand changes actually occurring in conditions, and at times to foresee or intelligently guess the nature and importance of changes which are only beginning to take place or which may even be only impending. In such a highly competitive industry as this, and in which annual model changes make surplus stocks of old model cars unsaleable except at a loss, promptness of adjustment, not only with respect to production, but in numerous other directions as well, is more necessary than in some other industries. Such adjustment cannot always wait for definitive statistical evidence, although there is constant effort to secure frequent and promptly compiled data.

In General Motors the recognition of the need of statistics as nearly up to date as possible has resulted in the regular compilation of such data as daily summary statements of working capital position; daily factory expense reports; daily production and shipment reports; daily telegraphic reports from the branch offices of General Motors Acceptance Corporation on car purchases financed on the time payment plan, made available in consolidated form the day they are received. Other types of statistics obtained at somewhat less frequent regular intervals are the ten-day reports by dealers of new car sales and stocks; similar ten-day reports of used cars sold to consumers, used cars taken in by dealers, and used car stocks in dealers' hands. These are illustrative of the statistical basis which has been, and still is being, developed in order to facilitate intelligent operating control. In General Motors—and it is true of other businesses as well—there has been an insistence from the very top of the organization on getting the facts, so that we might, to apply Descartes' picturesque phrase, "be clear about our actions, and walk surefootedly in this life."

The sooner we come to a realization that business management is a complicated series of undramatic processes, the sooner we shall understand that there is no royal road to business planning or to administrative control. Many persons inexperienced in business apparently fail to see that management must concern itself not only with the larger matters of planning and policy determination, but quite as importantly with a multitude of interrelated daily problems of adjustment and control.

In the everyday use of statistics in business, complicated statistical methods rarely are necessary and always are to be avoided if possible. Simplicity of treatment and presentation is a requisite in the making of statistics useful in executive control. This does not imply that ignorance of the more involved statistical methods is a good thing. The more the statistician knows of methodology the better, provided such knowledge does not make it impossible for him to use simple methods and to realize that he is living in a practical, changing world, in which common sense and time are valuable things.

And let us recognize that neither statistics nor the statistician can ordinarily give the executive the final answers to his problems. But they can help him to reach these answers. If we think of statistics as aids in executive control and neither as ends in themselves nor as marvelous tools whose use makes business management an easy and simple thing, we shall have a more just appreciation of how they can be made most useful.

BASES OF CONTROL FOR INDUSTRIAL OPERATION*

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Straight thinking is a prerequisite to all decisive and successfully aggressive action. What does this means to the business executive who is continually faced with the task of making decisions?

In the first place it would naturally require that he be constantly informed upon changing economic conditions, the progress of the enterprise in its own field, the effectiveness of the management concerned with each phase of the business and the best operating practice. In the second place, however, it requires the exercise of judgment, a keen sense of values and an understanding of what is best in view of impending circumstances.

Experience and business acumen are important guides in the direction of the course of business; however, what criteria are available for executive decision in effectively relating the agencies of production essential to industrial operation? Here lies an opportunity for the engineer to supply the business executive with that fundamental picture of the nature, relationship, and behavior of all contributory factors under varying conditions which will permit of more precise control. To facilitate judgment, this basic knowledge should be reduced to practical standards of performance that mark the most efficient or economical state of operation.

In giving thought to the economic balance of all factors, the economics of alternatives, or the economic cross over point between income and outgo, the work of the engineer is in contrast to that of compiling statistics, of preparing financial and accounting statements, or of budgetary procedures. As a result of this essentially different approach, in what way can the engineer contribute to a greater insight to the best proportioning of the money, men, methods, machines, and materials, employed by industry?

Taking up first the question of *methods* of production, what quantities of a certain article should be processed when conditions require manufacture for stock?[1] If lots of large quantities are processed infrequently the inventory cost will be high; if quite small lots are processed

* Revision of paper delivered at the Ninety-seventh Annual Meeting of the American Statistical Association, New York City, December 31, 1935.

[1] See F. E. Raymond, *Quantity and Economy in Manufacture*, McGraw-Hill Book Co., New York City, 1931.

at short intervals, the costs of preparing for manufacture will be excessive. Obviously, there is a lot size, somewhere in between where the total unit cost will be a minimum for a given anticipated sales volume.

However, it turns out that this point of minimum cost does not constitute the point of greatest economy if employment of capital and return on investment are also considered. The fact is a larger return on each dollar invested in manufacture can be obtained over a considerable range of production quantities below that for minimum cost. Therefore, it is essential to know the lot size for maximum return together with the limits of the range. The minimum cost quantity will only be of value in determining which process of several is the best to adopt.

Timing is another important consideration in the coördination of manufacturing operations.[2] The machine load budget or master production schedule serves as the actual standard for operating performance. However, time standards for processing are necessary to make possible correct scheduling in conjunction with the quantity standards derived from lot size determinations.

Instead of scheduling successive operations independently, the principle of simultation can be employed to determine the most economical process time. Insofar as possible the final time standard should approximate the time for a single piece to pass through all operations plus that for the lot as a whole to pass through the longest operation.

In continuous manufacture there often arises the question of the economical number of machines to be assigned to the care of a single operator.[3] The optimum machine assignment will depend upon the probability that on the average a given machine which has automatically stopped from some cause will have to remain idle more than a specified time because of others which have chanced to stop just ahead of it and take precedence in demanding the attention of the operator. Obviously, if too many machines are assigned to one man the waiting or interference time becomes extreme, whereas, if each operator has too few, the apportionment of his wages to output will be high.

Again the economic balance between[4] technical factors of the process where the respective costs have diverse relationships to output is of marked significance in the selection of the best process. This type of problem may require one of several forms of approach. First, which of several optional methods offers the optimum operating conditions

[2] *Ibid.*, Chapter XV.

[3] The only literature on this subject are two unpublished manuscripts in the hands of the American Society of Mechanical Engineers.

[4] See E. L. Grant, *Principles of Engineering Economy*, Ronald Press Co., New York City, 1930.

for a specified average output? Second, what is the optimum combination of design features to be incorporated into the process equipment? Third, what is the optimum of optimums where both design features and operating conditions must be economically harmonized? The resulting standards for control will take the form either of design specifications, of instructions for the most efficient operating practice, or of the most economical capacity for each process unit where they are to be operated in multiples.

In the selection and replacement of *equipment*[5] measures of some sort are essential to demonstrate whether a machine has become obsolete through technological change, whether one or another type offers the greatest economy in performing a given operation or whether a machine can pay for itself in a reasonable time and thereby justify its purchase.

The approach in this instance rests in a year by year comparison of the total cumulative out-of-pocket costs for the proposed equipment against those for the present equipment should it be continued in service. The desired criterion of economic and technical superiority may be found in the time it will take for the savings from a change in equipment to cancel the additional investment with due regard for all legitimate credits and debits alike to the present and proposed equipment.

This criterion of the "breakeven point" takes no account of the requirement to earn a return on the investment. A more exacting criterion is the point of time where the rate of return on the investment in the proposed equipment will exceed that for the existing equipment. This is usually spoken of as the "true economic life."

Either of these criteria needs in turn a measure to demonstrate whether the equipment will have ample opportunity to satisfy the specified economic requirements. Physical decrepitude, inadequacy or obsolescence may cut short the serviceable life. Therefore, information upon these factors must be available as well.

In addition, the management should watch the trend of sales because if the volume of business declines, the accumulated revenues will be insufficient for the equipment to pay for itself in the appointed time. A knowledge of the secondhand market for equipment is also essential as it may be wiser to scrap a machine than to allow it to get into the hands of an irresponsible competitor at a relatively nominal investment on his part.

If the breakeven point is determined for each machine at the time

[5] See F. E. Raymond, "Fundamentals of Industrial Equipment Policies," *Mechanical Engineering*, July 1933, Vol. 55, No. 7, page 411. Also H. O. Vorlander and F. E. Raymond, "The Economic Life of Equipment," *A.S.M.E. Transactions*, 1932, Vol. 54, No. RP—54-2-29.

of purchase, control of plant equipment and its economic replacement can be rationally effected through budgeting of requirements. At the same time, the accounting for depreciation can be placed on a truly sound basis.

Since labor is one of the primary factors of production, what criteria exist to indicate the best that can be expected from the *men* employed? Incentive systems have been devised to encourage greater output through the offer of a reward. However, who knows what is a fair standard of output per worker or a fair reward without a conscientious study of the man and the job?

Through careful analysis of the flow of materials, of operation sequences, of the relation of the man to the machine, of work methods and work bench layout and of the actual hand and body motions, based upon the principles of "motion economy," true task standards can be established for which there will be a minimum of effort and fatigue.[6] This information will be basic to costing, rate setting, placement, and the scheduling of production.

In the choice of an incentive plan,[7] it is far from a simple matter to determine which system of the many already devised is best suited to the conditions in a given plant. The fact is, a high cost plan will obtain an average point of response for the workers at a much greater per cent of standard task, than for a less costly plan, with the result that the actual unit cost of output will be lower. Therefore, before installing an incentive plan, knowledge should be acquired of the nature of the work, the grade of labor, the need for a strong incentive and the general efficiency of production.

For the adequate control of *money* I need only point to budgeting technique as a review of the practices for compiling current budget standards would seem to be beyond the scope of this paper. It appears more to the point to inquire into what a knowledge of the economic structure of an enterprise under varying conditions of business has to offer as a basis for a truly flexible budgetary control system.

By means of a graphical device known as the Economic Crossover Chart[8] it is possible to depict the relationship and behavior of individual and total costs with total revenue over all probable sales volumes. The lower the crossover point in terms of sales, where revenue begins to exceed the total cost, the more flexible the cost structure. The chart serves primarily to throw into relief those costs other

[6] See A. H. Mogenson, *Common Sense Applied to Motion and Time Study*, McGraw-Hill Book Co., New York City, 1932 and E. Mayo, *Human Problems of an Industrial Civilization*, The Macmillan Company, New York City, 1933.

[7] See C. W. Lytle, *Wage Incentive Methods*, Ronald Press, New York City, 1929.

[8] See C. E. Knoepple, *Profit Engineering*, McGraw-Hill Book Co., New York City, 1933.

than fixed or directly variable which account for the inflexible features.

Degressive costs tend to rise rapidly for increasing output at relatively low levels of sales, though they become more nearly constant at higher levels. They present the chief obstacle to continued profits in periods of business recession. Progressive costs, on the other hand, are of minor consequence at lower levels of sales but rise more and more rapidly as the normal or economic volume of business is approached and exceeded. They are largely responsible for narrow margins of profit at times of excessive business activity.

The younger the enterprise or the industry the less effect have these progressive and degressive costs; the older or more mechanized the more serious they become. Similarly price changes for raw materials and manufactured products with corresponding changes in the level of wages tend to distort these relationships of cost differently in periods of rising or falling business activity. Unquestionably, a knowledge of how the cost structure of an enterprise is influenced by these factors is indispensable in determining policies of expansion or contraction in view of approaching prosperity or depression.

In regard to *materials*, the control of quality is of primary importance since in the last analysis quality must be "satisfactory, adequate, dependable and economic."[9] For the latest techniques of quality control, statistical criteria, quality standards and specifications and inspection methods, I need only refer to the outstanding work of Dr. Shewhart, Mr. Dodge and others of the Bell Telephone Laboratories and of Dr. Gaillard of the American Standards Association, with which I assume all statisticians are familiar.

Uppermost at this time is the question how can industry be assured that the quality of its products will be entirely satisfactory and acceptable upon delivery to the customer?[10] The point is, a quality has no significance unless the ultimate consumer has definitely expressed a desire to experience the satisfaction of the existence of that quality.

To obtain a final measure of satisfactory quality the enterprise must first ascertain just what are the wants of its customers,[11] and through its merchandizing division prepare product specifications which will serve as the basis for the final design specifications to be evolved by the engineering division. The process division, in turn, must issue operating instructions and production standards which the inspection division

[9] See W. A. Shewhart, *Economic Control of Quality of Manufactured Product*, D. Van Nostrand Co., New York City, 1931. Also John Gaillard, *Industrial Standardization*, W. W. Wilson Co., New York City, 1934.

[10] See W. A. Shewhart, "Some Aspects of Quality Control," *Mechanical Engineering*, December 1934, Vol. 56, No. 12, page 725.

[11] See T. H. Brown, "Control of Distribution," *Mechanical Engineering*, December 1934, Vol. 56, No. 12, page 718.

will use as the basis for their measure of the run of quality and the rejection of defective units. Without knowledge of the incoming quality of raw material from the purchasing division there would be no guarantee of maintaining the approved standard of quality. Finally, through market research, proof of the initial interpretation of the desires of the customer will be obtained by measuring his acceptance of the product as manufactured.

Thus, it would appear that control should comprehend not only the measurement of conditions to be met and of the results achieved in dealing with them but also the evaluation of performance in terms of appropriate criteria of accomplishment. The statistician, comptroller and accountant each contribute the essential information derived from the former; the industrial or management engineer with his interest in fundamentals is in a position to supply the basic standards for the latter.

THE KIND OF INFORMATION AN EXECUTIVE NEEDS TO OPERATE A FACTORY*

By Walter F. Titus, *Vice-President*
International Business Machines Corporation

Before discussing the kind of information an executive needs to operate a factory, it may be well to examine the aims of such an executive. Usually his title would be Works Manager. What does he expect to do? What is his job? While there may be exceptions, it can generally be assumed that the aim of the executive can be summed up in one word "Control." An expansion of this definition might be stated as, "The regulation and government of a manufacturing plant, its equipment, its personnel and its functioning, so that proper quantities of the proper products of proper quality will be produced at the proper time at the lowest possible cost consistent with continuation or expansion of the business."

Now, if the aim is "Control" then the factors that affect plant, equipment, personnel and operation must be taken into consideration. Here is where the difficult part of Control is involved—and that is the relation of one factor to all others. It is for this reason that the executive cannot afford to lose himself in a mass of detail. He must have a bird's-eye view of what is happening. To get too close to any particular function has a tendency to destroy perspective and to give undue values to undeserving factors. Perhaps the most valuable asset of management outside of vision of future is the ability to develop a perspective of the past and present and to recognize values at their proper stature.

A fairly common spectacle is to see an executive appointed to handle a factory, develop overhead-phobia. He becomes a maniac on elimination of overhead, and starts eliminating every possible item, the good along with the bad, and we find that costs, instead of descending, actually rise, and that plant equipment deteriorates and morale sags until at length the whole operation sinks into innocuous desuetude. These overhead-phobes consider only one angle—"if it isn't necessary to output, put it out," forgetting that while an item may not be necessary to output it may be very necessary to the business. In the early days of the cash register, the owner of a beer saloon could have argued

* Paper delivered at the Ninety-seventh Annual Meeting of the American Statistical Association, New York City, December 31, 1935.

that the purchase of a cash register was unnecessary overhead—and that beer and whiskey could be sold without the aid of a cash register. But they all bought cash registers because those devices safeguarded the income.

Other executives may insist on high cost tooling to secure low cost production when a proper perspective on output would indicate such action as entirely unwise.

If an executive is to maintain his perspective then, it becomes desirable that he avoid unnecessary entanglements and to this end he should limit the kind of statistics, reports and forecasts coming over his desk, to those which will be of value to him.

An appalling amount of statistics are collected and collated in some institutions. Then these are bound neatly into encyclopaedias and in many cases are just as useful as an encyclopaedia. All encyclopaedias are obsolete by the time they are printed and you cannot run business on last year's figures. Another trouble with collated statistics is that when some need exists for their use, we find all too often that proper relationships have not been established. We may find that our personnel statistics are without flaw and that our wage rate statistics are equally good—but what we are looking for at the present moment, perhaps, is some relationship between them.

In another instance, we may have the finest records of machine tool equipment with complete information as to possible ultimate output of each machine. But unless we have present capacity demand, how are we going to determine what to do when a new product is to be manufactured?

The first trouble in many instances with statistics, if we are going to use them as tools of management, is that they are usually obsolete. And the second trouble usually is that no matter how cleverly various factors have been related, there always arises a new demand for a different relationship than we ever thought would be necessary.

But while this is true of statistics prepared ahead of time when the statistician is unable to outguess the management, it is *not* true if basic units out of which statistics are built are kept in a liquid form with proper arrangements for keeping the basic units current and with proper facilities for developing any kind of relationships of factors at the time of demand.

Management does not need fewer statistics. What management needs is more and better statistics, and there would be a far greater appreciation of statistics by management if they once found out that statistics did not have to be obsolete and could be prepared in proper relationships at little cost and in a short time.

An executive must be an optimist in that he must assume that 95 per cent of what is going on is being done correctly. What he must take care of, then, is the correction of the 5 per cent which is being done incorrectly. He cannot go around complimenting persons on their ordinary accomplishments. He has not the time to do this, and this means too that as he cannot be in all places at all times, he cannot personally detect what should be corrected. The only way he can do this is by current operating reports and even with these, his organization should have corrected all troubles before he sees the reports, so that his job largely is one of checking up and supervision.

The kind and frequency of information really needed by a Works Manager will vary according to the size of the operation and the particular type of manufacturing being done. However, taking a 4,000 man metal working plant manufacturing a diverse line of machinery, it seems that the following reports are important.

The Works Manager will want a summary of the Daily Force report so that he knows at once the number of people working, the number hired, fired, laid off and out with illness. He will want a Daily Output report showing by main products, what has been completed, what has been shipped and what new orders are received or issued. A Daily Departmental Efficiency report is useful—not so much for action by the Works Manager—as for the fact that the foremen and supervisors know he gets it.

A daily Budget or Appropriation report keeps the Works Manager advised as to expenditures made or allowable so that he may approve or disapprove further expenditure for equipment or for inventory or operating or maintenance expense.

Inspection Reports and Field Performance Reports indicate to the Works Manager the quality of purchases, manufacture, design or assembly. Collected information indicating probable life of specific classes of parts used in the product is of great value to the executive in determination of policy as to kind of tools to be used in the manufacture of such parts. This is particularly true in an industry where the art is changing rapidly.

Inventory turn-over reports in general classifications indicate possibilities for better control of this important factor.

One of the most important reports for the Works Manager is the Wage Rate report. It is of vital interest to him that his working people receive rates consistent not only with comparable work elsewhere, but also that his wage rates within his own plant are consistent as to skill, fatigue, working conditions and importance of task.

Long swing Labor Turnover reports may show to the Works Man-

ager the desirability of a housing program or change in some phase of supervision or change in working conditions, or indicate necessity for better methods of training.

There are, of course, many other reports that may go over the Works Manager's desk but it seems that good organization and proper selection of junior executives should keep these to the junior executives' desks. Such reports as Payroll and Wage Changes and Accident and Traffic and Power and Unit Costs and Stock Position, Maintenance Expense, Welfare Expense, Commitments and Expense Budgets should receive the attention of such executives and be acted upon by them.

Naturally the Works Manager will be interested in the monthly operating statement because to some degree it will tell the story of his stewardship to his superiors, but the information contained in it should be anything but news. An operating statement is a cemetery of facts—an archive whose chief value may lie in guidance for the future. But the modern plant executive is not prone to be retrospective in his operations. He is dealing with the present. To him a cost statement, necessary and desirable as it is in other phases of business, merely points out mistakes of the past. It is negative in this respect, it is a constant reminder not to do this and not to do that. The live executive is more interested in what to do than in what not to do, and when it comes to Cost Reduction, reasons that it is foolish to analyse, for instance, a parts operation cost because nothing can be done about it unless the design is changed, the process is changed or the factory morale built up. This being the case, the immediate question is, if cost can be reduced by redesign of one product, why not others, and if process change can reduce cost in one piece, why not use the same process generally, and if better morale will reduce cost of one operation, why not reduce cost of all operations by building up morale in general?

A plant executive cannot control plant operations from behind his desk. Plant control is not a cold, calculating, lifeless thing—it involves too much of human relations and personal contact. In fact, if one were to ask a Works Manager for a quick answer as to what statistics he used as a guide in plant operation, he would mention far fewer than he actually uses.

But no business is successfuly run without statistics, reports and forecasts. In themselves, they create nothing, they do nothing; but they inspire creation and they point to action and indicate decisions. Industry does not even yet consciously attach to figure facts the full significance and value that is theirs, but the appreciation is beginning to grow and will continue until management of industrial enterprise recognizes statistics as its right arm.

WANTED—INDUSTRIAL STATISTICS*

By Willard L. Thorp, *Director of Economic Research*
Dun and Bradstreet, Inc.

Statisticians are inclined to insist on the proposition that the business man engaged in actual economic operations should be vitally concerned with the statistics of his industry. We wonder how he can possibly survive without the aid and support of wall-charts and monthly mimeographed reports. We feel that without a steady diet from statistical tables, his mind must be in a continual state of bewilderment and frustration.

This morning, I propose to write the same prescription for our own profession, namely all those engaged as collectors, processors and distributors of statistics. We are an industry with problems of raw materials, technical processes and markets. And what is more proper than that statisticians should be concerned with statistics about statistics?

The twenties saw a boom in the statistical industry. And the last three years have seen the development and exploitation of many fresh deposits of new material in such varied areas as wholesale and retail trade, corporate earnings, real property and public health. It is fortunate that we have these causes for rejoicing, because the recent record of industrial statistics has reflected all too clearly the tendency of deflation, and the downward trend has not yet found a corner around which to turn.

I have prepared two simple tables of statistics about industrial statistics. I shall not defend their details. If twenty persons attacked the same problem, there might be forty different sets of figures. But I wish to make only one point, and I feel certain that each of the twenty tabulators would demonstrate this same point. In other words, the probable error, measured as a function of purpose, is so slight as to justify the statistical turpitude of hasty and rough procedure.

These tables are based upon the contents of the *Survey of Current Business*. They record the number of series, mostly monthly but a few quarterly, relating to specific commodities, excluding exports, imports, prices and data referring to non-processed agricultural commodities. In other words, they are the series of production, shipments, stocks,

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orders, and sales of specific commodities. A list of all series included in the *Survey of Current Business Supplement*, published in 1932, was used as a basis for the first table. All series were listed according to the first year for which the data were available. They were also divided according to the nature of the compiling agency. The data are as follows:

Year	Private Agencies	Public Agencies	Total
1923	195	244	439
1924	227	255	482
1925	272	270	542
1926	297	279	576
1927	333	290	623
1928	353	319	672
1929	381	330	711
1930	390	374	764
1931	395	387	782

At least three comments must be made about the data themselves. In the first place, every eligible series included in the *Survey* is given equal importance, although they differ widely in both scope and significance. Second, the dates are those where the series actually begin, rather than when first compiled or published. Frequently, the compiling agency was able to push the data back several years before the date when compilation began, and also, many series were not included in the *Survey* until some months after compilation started. Consequently a table of the incidence of statistics-collection would probably show greater concentration in the later years than is presented. Third, no account is taken of quality. However, statistics were no exception to the general behavior of the period, when the emphasis was on quantity rather than quality. As a result, the gains on the qualitative side were much less significant.

Despite these comments, the record is one of which all statistics-promoters should be proud. The statistical series available from private sources were exactly twice as numerous in 1930 as in 1923. And public agencies did not fall far behind. To be sure, there were still various important industrial areas not yet occupied by the questionnaire and tabulating machine. Nevertheless, as far as industrial statistics are concerned, it certainly was a "New Era".

But the record since 1931 is much less cheerful. Each number of the *Survey of Current Business* has been examined for births and deaths of statistical series, with the following record of the surviving population at the end of each year:

Year	Private Agencies	Public Agencies	Total
1931	395	387	782
1932	377	365	742
1933	361	352	713
1934	353	342	695
1935	333	348	681

No change has taken place in the policy of the *Survey* which can explain this reversal in trend.

One must note that this record is not a complete picture of all industrial statistics. Unfortunately some series collected by private agencies are not made available to the Department of Commerce. Annual data and series subdividing published data in greater detail are frequently compiled. And some industries collect statistical material which cannot be reconstructed as a continuous monthly series for lack of comparable data. But the significance of the record given above cannot be suppressed by any amount of palaver. One cannot make light of the fact that, during the last four years, some 75 series of the type here discussed were included in the *Survey* for the first time, while 176 were discontinued. In addition, many series, while still existing, have been so modified or revised as to break the direct comparability with earlier years. The plain fact is that our industry is threatened at the source. To be sure, many of the discontinuances are series of little importance to one interested in the broad picture of general economic conditions. And we can encourage ourselves by noting a number of instances of improved quality. But, despite all such apologies, we are still thrown clearly on the defensive. The boom collapsed four years ago, and no recovery is in sight. We cannot afford to lose more ground.

One may attempt to explain away the turn of events as a mere depression phenomena—that, in their search for economies, business men found statistical work a mere adornment and a luxury which could be eliminated. Trade associations, meeting their budgets with difficulty, were forced to curtail, and there was no one concerned enough to defend the statistics except the meek little clerk who compiled them. This is no answer but merely a restatement of our problem. Why were the statistics of so little value that they could be discontinued without vigorous protests? Why were they regarded as luxuries, useful for wall-decoration or public speeches only?

Some would blame the decline on the National Recovery Administration, that alleged Pandora's box, by saying that the National Recovery Administration required so much detailed data that it destroyed

any goodwill previously developed towards such materials. But more than half the missing series has already disappeared by the end of 1933. In fact, the National Recovery Administration was our greatest hope for reversing the downward trend. Many code authorities had statistical series in the process of incubation, but the infant series were not strong enough to survive the cold blasts, when the Supreme Court opened all the windows. And despite the Schechter decision, the future of many series a decade old, is still decidedly uncertain. We cannot assume that the statistical industry has natural forces of recuperation that will assert themselves if we are only patiently inactive.

Certain statistics are collected and compiled entirely by government agencies. With curtailment of budgets for government bureaus a certain factor in the future, even these series may be threatened sooner or later. But neither did they advance quite so sharply in the boom, nor have they as tragic a record of collapse during the winters of discontent. I am particularly concerned at the moment with series compiled by government agencies in coöperation with private groups, or by private agencies themselves. Here are the greatest losses to date and the immediate danger in the next few months.

By and large, this type of statistical work must rest upon the proposition that the results are useful to the business men themselves. No effective appeal can be made on the basis that the Federal Reserve Board Index of Production requires their data, or that the *Survey of Current Business* has extra columns to be filled. Many of us desire industrial statistics in order to depict and analyze general conditions. We hunger and thirst after more and more statistics, that every corner of the economic picture be filled with correct detail. But we forget that we are but the indirect beneficiaries of products created for other purposes. Our use is a by-product use. With only a few exceptions, the business men who do the work and pay the bills want statistics pertinent to their own specific and immediate problems.

There is no reason why both demands cannot be accommodated. Unfortunately, we have too frequently lost sight of the business man's problems. We blithely and automatically urge collection of totals data on production, sales, shipments, stocks, and orders. Perhaps what he really needs is the record of stocks of raw materials on hand, sales through specific channels, or production by size and grade. A given industry may be divided into many semi-competitive groups, by product, area or nature of market, and the business man may be much more interested in his group, than in the industry totals. In research, we have recognized that problems define data. The same principle must carry over to our dealings with industries if we would convince them

that statistics are worthy of their time and money. Fit the statistical program to the questions disturbing the business man, and it will not be a luxury.

This same failure to consider the primary producer and consumer of statistics appears in our treatment of results. We have made little effort to demonstrate that the results of statistical work are significant. We send out a mimeographed sheet and assume that all exposed will be inspired by a mere column of figures. We ought to be able to put it in its broader setting and show its implications, but we don't. The business man is often afraid to discuss the results with others in the industry for fear of "restraining trade". Of course, eventually "truth will prevail," but we have not always given it much assistance.

Nor have we considered the business man in matters of speed of compilation, or economy of operation. We are interested in history, but he is making daily decisions. We must serve him much better than we have in the past, to earn his support. If we cannot develop statistical programs of definite value to him, but of general significance only, it is obvious that the task becomes solely a government function and we cannot urge private agencies to undertake statistics collection.

An additional weakness has been the failure to deliver complete statistical pictures. Two series relating to semi-competitive products greatly increase the value of each other, especially in these days of explicit competition between industries. More important is the necessity of supplementing manufacturing records with data on distribution. Stocks in manufacturers' hands are usually much less important than in the hands of distributors or retailers, yet how seldom can we supply the total picture. The development of integrated statistical programs may be the only way to earn support in some areas of economic activity.

Finally, we have over-sold the potential usefulness of statistics, and now stand convicted. Statistics have not saved the world, and must find their niche as did scientific management a decade ago. They have not stabilized industries nor assured profits. They have not eliminated uncertainty. Yet they can do much more than they have in the past. The boom days are over, and we must now build our structure on more solid foundations.

In the past, the chief agency promoting the compilation of statistics has been the government. The activities of the Department of Commerce were largely responsible for the rapid advance in the twenties. But the current reaction in business circles against government coöperation cannot help but seriously handicap that agency in its continued endeavors. I cannot help but feel that much of this responsibility must

be assumed by the professional statisticians of the country. It is a matter too close to us, to be lightly disregarded.

The serious nature of the present situation has been recognized by the Board of Directors of the American Statistical Association in the recent establishment of a Committee on Industrial Statistics. But the creation of a committee does not relieve the individual members of the Association of their responsibility. It merely defines a point of focus to which individuals can bring their suggestions and which in turn can develop a program for action. Surely, our collective intelligence and energy ought to be able to find ways of reducing the present high rate of industrial statistics mortality.

I hope that I have painted an extremely dismal picture, but it need not be discouraging. It merely means that we have been put to the test, and been found wanting at certain points. The reaction was bound to come, but we are still far ahead of the situation ten years ago. Perhaps by forcing us to re-appraise our relationship to the members of the business groups upon which we depend, it will result eventually in a more moderate but more permanent upward trend for the industrial statistics industry.

A PROPOSAL FOR AN INTEGRATED PROGRAM FOR THE REPORTING OF BUSINESS STATISTICS TO GOVERNMENT AGENCIES*

By S. M. DuBrul
General Motors Corporation

The multiplicity of new governmental agencies set up in the past three years has led to much duplication of effort in the compilation of economic statistics. The increase in the number of questionnaires addressed to industry as a result of the Securities Act, the A.A.A., the N.R.A., the various research projects sponsored by the F.E.R.A., etc., has been enormous, so much so in fact that the cost of preparing the required material has placed a tremendous burden on industry.

The Central Statistical Board was charged with the responsibility of coördinating these various investigations and the elimination of duplication. The work of the Board in this regard is to be commended. Certainly had it not been for this organization, the burden would be far greater than it is at the present time. But even the members of the Board will admit that their efforts have not been entirely effective and that it will be a long time before a satisfactory degree of coördination results in eliminating the duplication which now exists and improving the quality and accuracy of the inquiries. Furthermore, there are many inquiring groups which are not subject to the jurisdiction of the Central Statistical Board so that its possible contribution to simplification remains limited. There are many State organizations not subject to the jurisdiction of that Board, in addition to a number of the Federal organizations, such as the Securities Commission, the Federal Trade Commission, etc., each of which may conduct its own inquiries without any required coördination with other Governmental agencies.

By the spring of 1935 this situation in the automobile industry had reached the stage of a major annoyance. Finally it was proposed that whenever inquiries other than those required by law were addressed to the members of the industry they should be forwarded to the Automobile Manufacturers Association for review. This procedure revealed a startling amount of duplication. It revealed further that many of the inquiries had obviously been prepared by persons whose knowledge of the industry was quite vague. Questions were couched in unfamiliar terms and it was frequently apparent that the information requested

* A paper presented at the Ninety-seventh Annual Meeting of The American Statistical Association, New York City, December 27, 1935.

would not only be inaccurate but would be wholly misleading. The Association was then requested by the members to prepare a program for dealing with this situation which would relieve the members of the necessity of making so many individual replies and at the same time would assure the industry that when the information was furnished to the inquiring parties it would be accurate and not subject to serious misinterpretation. The Association was also requested wherever possible to make a consolidated reply for the industry in every case where it would be sufficient.

The staff of the Association accordingly went to work on this assignment which has resulted in the following procedure:

1. All inquiries, regardless of source, other than those required by law, are first sent to the Association for review.
2. The Association then determines whether a consolidated reply can be made for the industry as a whole from existing records (experience indicates that most inquiries can be handled in this way).
3. The Association then communicates with the inquiring organization to determine whether a consolidated reply will be satisfactory. If so, the members are then notified that the Association will take care of the matter.
4. This in no way interferes with the right of the individual member to make an individual reply if he so determines. For this purpose, the individual inquiries are returned to the members if they desire so that they may proceed with their individual replies.

This procedure has been in operation for some months and its results are eminently satisfactory to the members of the industry. Outside of certain schedules required by law to the various State and Federal organizations, practically no individual replies are necessary any longer except to the Association itself. The Association's program has been modified to comprehend all pertinent data so that the Association in turn can supply all proper inquiries. The expense of answering questionnaires has been materially reduced. The confusion attendant thereto has also been eliminated. The Association reports, being a routine matter, can be delegated to the clerical force. New inquiries only need be considered by the members to determine any policy questions which may be involved.

From the point of view of the inquiring bodies, this arrangement also seems to be eminently satisfactory. Most organizations only solicit the individual members in the industry to secure industry totals. When the Association explains that it can furnish the industry totals very readily, in a much more comprehensive fashion than can be obtained by direct questionnaire and with a detailed explanation of the reservations which

surround the information, that is, the deductions from it that are proper and those which are not proper, the inquiring organization is usually more than pleased to accept the Association's reply.

In a number of instances, the Association has been able to demonstrate that the information sought was not the information which the inquiring organization really needed for its purpose and that substitute information would be much more useful. In other cases, the Association has been able to demonstrate that the inquiries were entirely too brief for their purpose.

This procedure is entirely in accord with the general belief of industry that industrial statistics should to whatever degree practicable be compiled through the trade associations rather than directly by the Government.

Experienced and impartial persons in the field of industrial statistics all agree with this general position. The trade association is composed of and supported by the members of the industry and generally has far less difficulty in obtaining comprehensive data voluntarily than any Government agency. Furthermore, every industry interested in a statistical program at all will desire to collect much more detailed data than would be advisable for any Governmental agency to collect as a regular activity. Even though the Government were to collect the data in the detail desired by the industries, the burden of such an undertaking on a centralized basis is impossible to conceive, if the reports are to be economically and promptly summarized and distributed.

I am fully aware that there is strong opposition in some quarters to this position on the grounds that associations are poor custodians of confidential data; that they seldom appreciate the need for trained statisticians and that their tenure is often uncertain, and that consequently the Government should assume the task of gathering all reports of current economic activity. But in any industry in which the members are not sufficiently alive to their own needs for a good statistical program, the substitution of a Government agency, although it may produce more and better data in some cases, will not compel their use in better management of the industry and thus the data will be of only historical interest to a few students.

Furthermore, it is my belief that these admitted deficiencies of many associations can be remedied in time so that it will be entirely unnecessary for the Government to collect individual reports of current business transactions on a broad scale. My proposal for accomplishing this follows.

Before a trade association can be looked upon as a reliable agency for gathering economic statistics required for public purposes:

1. The continuity of its statistical program must be assured.

2. The competence of its personnel must be demonstrated.
3. Its character as a custodian of confidential information must be demonstrated.
4. The adequacy of the coverage of its industry must be established.

Whenever an association qualifies under each of these four counts, there should be no hesitancy on the part of the Government to accept information compiled by it. Accordingly, it is proposed that the Central Statistical Board be empowered to certify to the other Government agencies those associations, the statistical work of which, after examination by the Board according to these standards, is sufficiently reliable that the Board can recommend the use for governmental purposes of the current data compiled by them. Thereafter, in any industry where there is such a certified association, no inquiries should be addressed to individual members by any Government department unless the information cannot be secured through the association. As a further strengthening of this stamp of approval, it would be desirable if the Board would also recommend that even non-members in the industry should make their reports in the first instance to the association, which will then transmit the schedules to the authorized agency empowered to seek it.

Of course, the Board should make it plain to all such associations that it reserves the right to require periodical proof that they are maintaining the Board's standards so that it could be assured of the continuing reliability of those whose activities it certifies.

It seems to me that this program would accomplish a number of worthwhile results. In the first place, it would draw a sharp line of distinction between those associations which are qualified to occupy a quasi-public position as a sort of branch of the Census Bureau as compared to those which are not so qualified. Once this mark of distinction became established, it would create a powerful pressure in the non-qualified associations to set up their activities in a manner which will enable them to become qualified. This would result not only in a pressure for better industrial statistics but would be bound to raise the whole plane of trade associations because in order to retain their marks of distinction for their statistical programs, the associations would naturally tend to raise their other activities to an equally high ethical level.

Furthermore, it would assure the compilation of statistics in the most economical manner. Decentralization of activity is always desirable to the greatest possible degree whenever efficiency is a consideration. The gathering of all industrial statistics in any broad way is an expensive undertaking and to decentralize the task among well-quali-

fied trade associations would assure a continuous check on the usefulness of the information, because the members, being conscious of the expense, would always be endeavoring to keep this activity on a justifiable basis.

A third advantage of such a program is that it would raise the plane of the personnel in the field. One of the requirements for certification would be the employment of competent personnel. The statistical profession would thus benefit since to obtain an approved status, the associations and their sponsors would have to recognize that economic statistics is as much a profession as public accounting, actuarial science, or architecture. Since the American Statistical Association is anxious to accomplish this recognition of its professional character, it should assist in the promotion of any program which will tend to accomplish that objective.

I am sure that a program of this nature properly worked out by the Central Statistical Board and presented to the various industrial groups would receive a hearty welcome by most of them and will greatly accelerate the production of better industrial statistics for all interested parties.

Discussion*

Discussion from the floor by Messrs. Hotelling, Thurston, Carpenter, Cohenour, Mitchell, Hunt, Belcher, Lutz, Meehan, Miss Joy, and others, centered around Mr. DuBrul's paper. It was pointed out that information for taxation and regulation of industry cannot be provided for the government through trade associations, who represent parties in interest; that not many trade associations are equipped to handle statistics and therefore only a small fraction of industry could be covered in this way. Some trade associations do not represent all of the important firms in their industries, and their history has been one of high mortality, the statistical series dying with them. On the other hand, it was stated that government agencies had occasionally discontinued data important to the industry through lack of funds, that government agencies often did not know enough about the operations of industry properly to phrase requests for data or to interpret the data when reported, and that government statistics also needed investigation from the industry's point of view. The importance of accurate interpretation was stressed. It was agreed that any program for improved industrial statistics would be slow to develop and would require close coöperation between government and industry, such as the Central Statistical Board had recently arranged for the textile industries in connection with the forthcoming Census of Manufactures. The importance to industry of integrated vertical statistics representing various stages of production and distribution, as well as production, employment and payrolls, as one stage of the process was stressed.

* Summary of the discussion of Mr. DuBrul's paper, prepared by the chairman, Miss Aryness Joy

EFFECT OF N.R.A. ON THE PHYSICAL VOLUME OF PRODUCTION*

By Leonard Kuvin
National Industrial Conference Board

Evidences of the effects of the provisions of the National Industrial Recovery Act on the physical volume of production may be sought (1) in the magnitude of the movements of the total volume of output, (2) in the monthly pattern of the movements of the total, (3) in the characteristics of output of individual industries, and (4) in the economic influences of the process of coöperative action, or of specific measures in particular code agreements.

We can begin our inquiry with an examination of the movements of the composite index of manufacturing production of the Federal Reserve Board. We see in it an irregular but unmistakable advance from July, 1932, to July, 1933. During the ensuing months we observe a succession of movements which resulted in a net general decline. If our inquiry were based upon these observations alone and upon the fact that the National Industrial Recovery Act was signed on June 16, 1933, we might easily arrive at the conclusion that the decline in the total volume of manufacturing production in evidence after July was associated with the enactment of the law. We could state, further, that the increases in volume prior to July was a result of collective anticipation on the part of industry of increased costs of production. Some observers have seen in these facts the basis for a conclusion that the passage of the act resulted in the restriction and curtailment of production. By the same token, however, the lifting of the act should have resulted in an immediate expansion of output.

If we turn to movements of the index since May, 1935, when the act was pronounced unconstitutional, we witness a brief interlude of curtailment, even after cognizance is taken of seasonal retardation. Could it not be argued that the lifting of regulatory mechanisms failed of an assumed function? It could, however, be contended contrariwise that this was an interlude of a particular sort, in advance of the increases which we know followed in the second half of 1935.

Nothing but confusion of thought can result from such an analysis. Nor does it help matters to resort to a usual practice of statisticians, to

* A paper presented to the Ninety-seventh Annual Meeting of the American Statistical Association, New York City, December 28, 1935.

implement words and phrases with figures. We could go further, and examine industries in the aggregate at times when major codes were in force.

There is strong temptation at this point to construct an index of the physical volume of production that will include only such fields of activity as were regulated, introducing them at dates when codes were adopted. Such an index could then be compared with an index of production of all industries regardless of when codes became effective,—and deductions could be drawn.

This process is here waived for the fact that there are no better bases for circumventing the errors in reasoning about particular data of production than exist with respect to the composite of all of them.

Our basic difficulties arise from the fact that the volume of production of goods is affected by a number of economic factors not related to measures embodied in N.R.A. codes. Our economy is influenced in periods of depression as well as in periods of prosperity by world conditions, for one thing. Fluctuations in prices due to international arrangements affect domestic price levels. Changes in our general price level internally, brought about by monetary measures, are economic influences upon production of a high order of magnitude. Moreover, the availability of credit and the freedom of capital to flow into enterprise are items which have a direct bearing upon the physical volume of production. There are others which can be enumerated, but the purpose is here served by these few. To dissociate their effects from the influences of provisions in codes introduced at various times and in differing ways is virtually impossible. We pass then to our second consideration,—the pattern of monthly movements of the total.

The position taken in our first item of attack applies here with equal force. If N.R.A. exercised specific effects upon the pattern of monthly movements how can these effects be isolated from those of the other factors mentioned? The engagement of *post hoc propter hoc* reasoning, it may be unnecessary to state, has no place in a statistical investigation.

If we turn to an examination of the characteristics of output of particular industries, our third item, we find our way beset with the same difficulties.

In the cotton textile industry the prospect of increased labor and overhead costs prior to the adoption of the code was preceded by advances in raw materials prices induced by the suspension of gold payments. A sharp rise in output in the second half of 1933 was followed by a decline in 1934. To what extent was this latter movement a result of the textile strike in the third quarter of 1934, or to a reaction against

the accumulation of large inventories in the second half of 1933? Can this question be answered by a statistical study that will isolate the effects of the code? The position here taken is that it cannot.

We turn, therefore, to our fourth line of inquiry, namely the economic influences of coöperative action. For this the experience of the automobile industry will serve our purpose.

It can be claimed that the existence of a code induced the first concerted attempt to regularize output in the automobile industry. The revised code adopted in February, 1935, carried a provision for staging the annual show during November, instead of during January. While the possibility of changing the date had been discussed in the industry for years it is conceivable that the agreement to do so in the code provided the last necessary impulse to achievement.

Whether the modification of the pre-N.R.A. seasonal pattern will be a permanent matter is a question that will be answered by the manner with which consumers react toward the change. In any event, the shifting of the low ebb of production from November to September was accomplished in 1935.

The effects of this single change upon other fields of productive enterprise are easy to understand. Output of some divisions of the steel and iron industry were influenced and expanded by the shift in 1935. Auxiliary industries catering to the needs of the automobile, the steel, and the iron industries were similarly affected.

These influences may conceivably be accredited to N.R.A. But whether this change might not have arisen at the time had there been no code is worthy of serious thought, for it had become obvious in the course of the depression that increases and decreases in activity beyond seasonal expectation were recurring with regularity. Business men and students had become aware of the extra thrusts given to activity by the expected monthly forces of expansion and retardation. This knowledge alone might well have been responsible for the shift in the automobile industry.

With this we terminate our inquiry. The position taken in this discussion is that the statistical evaluation of effects is interwoven in the qualitative aspects of the problem, and cannot be dissociated from them.

We conclude by stating (1) that the effects of N.R.A. on the general physical volume of production cannot be dissociated from the effects of economic forces not related to N.R.A., and (2) that in particular industries those changes that may have been induced by the process of code adoption might otherwise have been induced by the observations of men in an altered set of general economic circumstances.

UNEMPLOYMENT INSURANCE AND UNEMPLOYMENT*

By M. C. Rorty

Certain of the elementary facts with regard to unemployment insurance are very simple and quite familiar to most of us. We cannot make a something out of nothing. Business and industrial profits, on the average and in the long run, show negligible margins, if any, which can be diverted to increased wages or other payments to labor. Substantially the same conditions hold with respect to high salaries and bonuses. And, finally, there are no important margins of large incomes still untouched by efforts to "soak the rich," which can be drawn upon to cover the cost of unemployment insurance.

All these facts are adequately documented for those who wish to verify them. They lead to the necessary conclusion that the costs of unemployment insurance, to the extent that they are not offset by very doubtfully resulting direct economies and increases in productive efficiency, must be paid, in the end, either by the workers themselves, or, through increased tax burdens and prices, by consumers and those of very moderate means.

In this shifting of the costs of unemployment insurance to workers and consumers, the real question seems to involve not so much the ultimate results, as the successive steps by which the shifts will be brought about, and the time required. A combination of tax theory and experience, with the opinions of accountants and large employers, indicates that the immediate results will be some initial increases in the prices of goods and services, accompanied by occasional temporary reductions in profit margins. To this extent, those directly benefited by the insurance will profit for a time at the general expense of consumers and shareholders. In due course, however, the unemployment benefits should become substituted for increases in real wages which might otherwise take place, and the whole burden of such benefits will be shifted to the workers directly involved.

The preceding viewpoint is, of course, of controlling importance in a consideration of the whole problem of social insurance. The dangers of the situation do not lie in any conclusions which the average hard working citizen of modest means might reach, if he faced the facts squarely, and realized that the problem was simply one of a common

* A paper presented at the Ninety-seventh Annual Meeting of the American Statistical Association, New York City, December 30, 1935. [Colonel Rorty died on January 18, 1936. A tribute to his great service to the American Statistical Association will be published in a later issue of the Journal.]

sense decision as to how much he, personally, was or was not willing to pay for specific insurance against economic hazards for himself and his family, as well as for more general protection for the superannuated, disabled, and incompetent.

If the average hard working citizen should reinforce such approach to the problem by avoiding generalizations and by considering just what could and should be done in his own community for particular individuals and families that he knows; if he would measure and balance each item of social insurance against its costs, and would then compromise and adjust to the levels of practical possibilities, and of maximum benefit per dollar of costs—under such circumstances we might have some real insurance that programs of social security would become worthy of their name, in place of threatening to become breeders of social insecurity and demoralization.

The unfortunate situation, today, is that the average worker has been promised the rainbow with a pot of gold at the end. He has not been asked honestly how much he would like to pay for social insurance, and of what kinds. On the contrary, the implied question has been how much he would like to have, if someone else did the paying.

Under these circumstances there is a special obligation upon the real well-wishers of the common man to protect him against the folly of his over-optimistic friends. Statisticians are not distinguished by great wealth. They show, perhaps, in more than average measure, the idealism and human sympathies of scientific workers as a class—but on the other hand they are specially trained to look facts in the eye. So it is the statistician, and particularly the economic statistician, upon whom may fall the principal burden of telling, from now on, the unpopular, but necessary, facts regarding current programs for social security.

My particular task on the present occasion is not, however, that of surveying the whole field of social security, and of balancing costs against possibilities of payment, and against the real value of social benefits. It is the more limited problems of determining how far unemployment insurance in general, and the typical present programs of unemployment insurance, may actually operate to reduce or increase unemployment.

This limited problem cannot, however, be wholly divorced from the broader problem of social security as a whole. In itself, an unemployment insurance program requiring total contributions at the rate of say, 3 per cent of payrolls would not be unsupportable, even when superimposed upon those other normal burdens of government and otherwise, which fall upon consumers and workers. It would represent, in the ordinary course of economic progress, no more than 3 years' gains

in real wages which had been diverted from current consumption by the employed, to similar consumption by the unemployed. At the end of such 3 year period we might not unreasonably expect to find that the average employed worker had as great a real income available for current living expenses as he had at the beginning of the period, plus the insurance benefits and protection as net gain during the interval.

On the other hand, if the unemployment program should prove to be the straw, or one of several straws, in the general social security plan, which finally operated to break the economic camel's back, any possible benefits from unemployment insurance would quite certainly be lost in the general debacle. Any separate consideration of unemployment insurance must, therefore, be subject to this general reservation, that it shall not prove to form part of a generally unworkable program.

We have already examined the reasons which indicate that the costs of unemployment insurance must be borne by the consumer and worker, and which justify the expectation that, in due course, substantially the entire costs will shift to the workers directly involved. This latter expectation carries with it an interesting corollary which bears directly upon the possibility that there may be a wide and wholly desirable latitude in the unemployment insurance plans of different states, without seriously hampering interstate competition between employers who are and are not subject to levies on their payrolls for unemployment funds. Even if the tax features of the present Federal legislation should be declared unconstitutional, there is a very real possibility that the shifting of the burden of insurance from prices to workers would take place at a rate sufficiently rapid to offset the annual increase of 1 per cent of payrolls in the levies on employers, which is contemplated in typical plans. In other words, it is entirely possible that wage rates will increase sufficiently more slowly in states which have insurance plans than in those which do not, to offset the payments made by employers. Eventually this should be the case, and employers will be wholly justified in insisting that wage comparisons between different areas shall not disregard difference in payments made by them into unemployment reserve funds.

But let us now consider the more specific angles of unemployment insurance.

The objectives of such insurance, according to various proponents, include:

1. The payment of lay-off benefits to temper the hardships which arise, even in normal times, through lay-offs and other changes in employment.
2. An extension of such payments which, without being carried to

the extent of providing complete relief in major depressions, will nevertheless serve as a large measure of relief in minor depressions and may, furthermore, operate to reduce their severity by maintaining consumer purchasing power.

3. A final extension of payments to cover complete relief requirements in times of long continued major depressions.

Of the preceding elements in any possible plan of unemployment insurance, the desirability of a reasonable scale of lay-off benefits, as such, has long been recognized by progressive employers. Such benefits, if carried only to the point justified for the tempering of the hardships due to shifts in employment during times of average business activity, will, however, involve expenditures of only a fraction of those contemplated by present programs, and would, even in theory, have little bearing on the major problems of employment stabilization and unemployment relief.

At the other extreme of possible programs, both our own recent experience and the longer experience in Great Britain have supplied convincing evidence that any plan of unemployment insurance supported by contributions from industry and workers, must be supplemented, in major crises, by much more general programs of public works and publicly supported relief.

To simplify our present discussion, we may eliminate both of the preceding extremes and ask ourselves a single question, which is—"Without attempting complete relief in major crises, how far, may a normal scale of lay-off benefits be expanded in the expectation that it will tend to reduce seasonal and cyclical unemployment?"

The question of seasonal unemployment, for our immediate purposes may be passed over rather quickly. Any system of unemployment insurance which allows even a very moderate incentive to the individual concern to reduce seasonal variations in employment cannot fail to have important value in eliminating many such variations which exist not of necessity, but mainly because of lack of systematic efforts to avoid them.

However, the maximum measure of such incentives may be only on the scale of 1 per cent of payrolls. Such incentives will not, and cannot, be directly effective in eliminating the more serious types of seasonal unemployment, such as those evidenced in the building trades and in bituminous coal mining. Buildings may be manufactured for stock in the future, but such possibilities are very limited today. Furthermore, bituminous coal can only to a very limited extent be stored at the mines. In these instances, and in others where the seasons or seasonal styles dominate, the elimination of seasonal variations in output must arise mainly through a stabilization of consumers' demands—and the in-

centive to the consumer for off-season purchases, or for risking losses through style changes, must be very substantial off-season price concessions. Furthermore, such price concessions cannot result from mere shadings in profit margins. These average only from 5 to 10 per cent of wholesale prices, whereas the price variations required to stabilize demand may range from 15 to 30 per cent. The indicated solution appears therefore to lie in substantial seasonal variations in the major cost factors, wage and freight rates being specially important. Such cost variations might even be carried back a second stage, as, for example, by encouraging winter building through lower winter prices on structural steel, plus lower freight rates, and wages for building labor —all these to be counterbalanced by corresponding increases in prices, wages and freight during the summer.

If we turn, now, to the major question of the possible influence of unemployment insurance in minimizing cyclical variations in employment, our first difficulty is in arriving at any definite proof of advantages or disadvantages. We may argue from British experience that unemployment insurance has contributed to both chronic and depression unemployment—or in the reverse direction, if we wish, we may contend that the recent relatively rapid British recovery has been due to the unemployment relief payments. But the only thing wholly certain is that such statistical correlations as exist run wholly true to form in proving exactly nothing at all. We are forced, therefore, as in most economic problems, to deal with general experience and tested cause and effect relations.

We know that arbitrary and rigid levels of prices and wages may lead to chronic unemployment and even to active business depression. We know, also, that when a depression has its source, in whole or in part, in abnormal price and wage levels—in prices and costs of production which are so high as to prevent the marketing of important volumes of goods in national or international trade—recovery will probably be delayed until such abnormalities are liquidated. But we do not know, unfortunately, just how far such liquidation may progress with advantage, and at what point it may, in turn, become itself the contributing cause to further depression, rather than to recovery. At the best, we can only surmise, from experience with depressions which have resolved themselves without running to extremes, that the desirable movement of prices and wages is one which only very slightly over-runs the point of adequate liquidation, and which permits of a substantially exact balance to be restored in the early stages of recovery.

Within these limits of what we know and don't know, it is possible only to arrive at a few definite conclusions.

Unemployment insurance which does not operate to prevent that

flexibility in wage rates which is required for the restoration of balanced price relations in times of depression, and which does not further those price and wage rigidities which breed chronic unemployment and acute depressions—such insurance should operate to maintain purchasing power, and in the case of moderate business reactions, not involving extensive liquidations or serious declines in capital goods activities, may operate in positive fashion to bring about recovery.

In the reverse case, unemployment insurance and, even more particularly, doles, which operate to further wage rigidities, will tend to create chronic or acute unemployment and to prolong periods of depression.

As a further general consideration, the need in times of depression is not for a maintenance of wage levels or even of consumer purchasing power, but for a prompt restoration of business and industrial profits and prospects. To put this situation in simple form—it is almost impossible to pay the shirt makers enough to put the carpenters to work, but when the carpenters are at work we do not need to worry about the shirt makers.

All these generalizations are far from that exactness and nicety of proof which is the pride of the statistician. They will constitute no proof whatever for those who are wholly unwilling to be convinced. But for those who are willing to follow the facts, wherever they lead, the evidence seems clear in economic theory, in experience, and in obvious cause and effect relations—and is not controverted by the available statistics—that unemployment insurance, at the best, can have little effect in stabilizing employment and at the worst may be a breeder of chronic or acute unemployment.

The real dangers lie, however, not so much in unemployment insurance, which in major depressions must soon be exhausted, but in supplemental doles and systems of relief which aim at, or tend to maintain, rigid levels of money wage rates at times when a liquidation and readjustment of price levels is required for business recovery.

All this might seem to be a hard and inhuman doctrine, were it not for the fact that experience shows a reduction in average *real* wages to be rarely, if ever, required. The maximum need appears to be for a flexibility in money wage rates which shall permit them to parallel declines in the cost of living.

Finally, it should be unnecessary to say that none of the preceding considerations are arguments against reasonable and properly administered systems of lay-off benefits—which are not perverted in the attempt to make them cures for, or preventives of, unemployment, or general systems of relief in major depressions.

SETTING UP STATE ADMINISTRATION FOR UNEMPLOYMENT INSURANCE*

By Glenn A. Bowers, *Executive Director*
Division of Placement and Unemployment Insurance, New York State Department of Labor

"Setting Up State Administration for Unemployment Insurance" is particularly timely because of the pioneering stage of this phase of Social Security Legislation. In the administration of the New York Law, we are conscious of the fact that steps taken in this State may have an influence far beyond its borders. This peculiarly prominent position among all States is not of our choosing, but rather is due to the fact that New York is the largest industrial State and that the New York Law was the first to be established on the pooled fund principle and directly tied in with the Federal Social Security Act of 1935. It behooves us, therefore, to maintain as our constant goal the objectives of simplicity, economy and effectiveness of operation of this Law. We shall need a great deal of help, therefore, from Federal officials and those of other States and from other authorities.

For the benefit of those who do not recall its details, may I briefly summarize the New York Law. The contribution or tax is placed solely on the employer, this Law not involving employee contributions. The amount of the tax in 1936 is 1 per cent of the covered payroll; that is, all wages or remuneration paid to manual workers, and all wages and remunerations paid to non-manual workers receiving at the rate of not more than $50 per week or $2500 per year. In 1937 this tax becomes 2 per cent, and in 1938, 3 per cent of the covered payroll. Although the tax becomes payable beginning with employment on January 1, 1936, it is not to be paid, according to the requirement of the Law, prior to March 1, 1936. The Industrial Commissioner has recently extended this date, so that contributions are not to be paid prior to April 1, 1936.

All employers who have had four or more persons in employment covered by the Law within each of thirteen weeks in 1935 are required to pay contributions. Employment as a farm laborer is excluded, also employment of the employer's spouse or minor child and service performed in governmental agencies and in non-profit enterprises operated exclusively for religious, charitable, scientific, literary or educational purposes. Benefits to unemployed workers are not payable before

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January 1938. The maximum benefit will be $15 a week, the minimum $5; duration of benefits is equivalent to one week of benefits for each fifteen days of employment for a maximum of sixteen weeks. The actual amount of benefits is equivalent to 50 per cent of full time weekly earnings. No worker is eligible for benefits who has not had within the previous year 90 days of employment or within the previous two years 130 days of employment.

The New York Law is administered by the Industrial Commissioner. There is an Advisory Council of nine members, representing the employers, workers, and the public, appointed by the Governor. An Appeal Board will pass upon disputed benefit claims. Industrial Commissioner Elmer F. Andrews has created a Division of Unemployment Insurance and has combined with it the State Employment Service so that the two will operate as an integral unit. Beginning January 1, 1936, the executive offices of the Employment Service will be physically combined with those of the Unemployment Insurance Administration, and the work of the enlarged Division will be in operation on a functionalized basis. The Division will have four major functions, namely: (1) General administration under the executive director. (2) Placement service under the continued supervision of the director of the New York State Placement Service, Mr. William H. Lange. (3) Unemployment Insurance records control, under the supervision of the Comptroller of the Unemployment Insurance Division, Mr. Harry K. Herwitz. (4) Research activities, under the Director of Research, Dr. Meredith B. Givens. The remaining functions including interpretation of the Law, personnel administration and various duties under office management are classified under general administration.

The main office of the Division is located in Albany. There will also be a large office in New York City. The State will be divided into two administrative regions, the up-State region and the New York Metropolitan region, including New York boroughs, and Rockland and Westchester Counties, and all of Long Island. These regions will be divided into districts. The responsibilities of the regional and district offices will be supervisory in character. The local offices and the central offices will carry the bulk of the work. Employer and employee records will be centralized in Albany and in New York City. In the local offices the staff will have the dual functions of placement and unemployment insurance administration. They will be called local employment offices rather than unemployment insurance offices.

The combination of Employment Service and Unemployment Insurance in New York State is perhaps the most significant by-product of the new legislation. Without such coördination of ser ices no State

in our judgment can effectively operate an Unemployment Insurance program. The incorporation of the employment service with unemployment insurance work should elevate the employment service to a position which it has long deserved but which it has not achieved in any State. Placement can no longer be looked upon as a voluntary, incidental public service. It need no longer continue in the position of "selling" its services to those employers who for various reasons have not wanted to use them. Properly administered Public Employment offices, in connection with unemployment insurance, should in time become a source to which employers and employees will turn naturally for their placement needs. The task of the employment service and of the unemployment insurance administration is to deliver high quality service, which is the best form of salesmanship for any enterprise.

The records and accounts procedure for New York State involves the following major operations: (1) registration of employers, (2) receipt and recording of employers' contributions, (3) record of employment status of individual employee, (4) record of benefit payments, and (5) general accounting.

Considerable discussion has occurred on the issue of maintenance by a state administration of individual employee data covering employment status and earnings. In New York, we have conferred for six months with employer committees, accountants, controllers, and others experienced in industrial payroll practices and in public administration. From these conferences, many suggestions for simplification have been obtained. This process is still going on. It is our belief that the system of record keeping eventually to be adopted for individual employee data must be sympathetically understood and concurred in by those who are to submit reports as well as by the State administration. This follows the principle that no Law is effective unless it receives the support of the majority of those who are required to comply with it.

Having in mind the many phases of this accounting problem, which have not yet been adequately explored, including the necessary coördination of State records administration with the requirements of the Federal Social Security Board, the Collector of Internal Revenue and the United States Employment Service (with respect to placement data), the question of amending the New York Law so as to permit more time for working out solutions to these problems was raised with the New York Unemployment Insurance Advisory Council. This Council has recommended and the Industrial Commissioner has concurred in this recommendation to the Governor and to the Legislature that the New York Law be amended to make unnecessary the assem-

bling of individual employees' work records during 1936. This will be accomplished by amending Section 503, Subdivision 3, Paragraph C of the Law, so that employment during 1936 would not be used in qualifying employees for unemployment-benefits to be paid after January 1, 1938, when payment of the benefits will begin. If the Governor and the Legislature concur in this recommendation, the additional year available for preparatory work should ease the pressure in setting up the necessarily large administrative organization and make possible our gradual assumption of responsibilities. Employers, likewise, will have an opportunity to adjust their own payroll records simultaneously to meet the requirements of the Old-Age Benefit section of the Federal Law and of the State Law for Unemployment Insurance.

The general accounting procedures under the New York Law involve the setting up of an Unemployment Insurance Fund, an Unemployment Trust Fund, and an Unemployment Administration Fund. Into the Unemployment Insurance Fund will be placed all contributions collected by the State of New York which are reserved exclusively for the payment of benefits. This fund is in fact little more than a record of contributions received. These funds are placed at once in the Unemployment Trust Fund with the Secretary of the Treasury of the United States for the account of the State of New York Unemployment Insurance Fund. The moneys are invested by the Secretary of the Treasury. The earnings of the moneys in the Unemployment Trust Fund are credited to the account of the State of New York Unemployment Insurance Fund at proper intervals or when they are withdrawn. When moneys are required for the payment of benefits, a requisition is made on the Secretary of the Treasury, who then returns the required funds to the Commissioner of Taxation and Finance of the State of New York to hold until disbursed as directed by the Industrial Commissioner. The Unemployment Administration Fund consists of moneys received for the administration of the New York State Law. It is administered by the Commissioner of Taxation and Finance and the State Comptroller as in the case of other State moneys.

Obviously, there are many problems connected with the setting up of the administrative organization in a State such as New York which have not been specifically mentioned in this paper because of the necessity for brevity. We feel that within the limits of the $100,000 advance made by the 1935 Legislature for the initiation of this program, we have a reasonable degree of control over our situation. Two instructions have been issued to employers, the first one specifying that following information shall be maintained on employer's records:

(a) Insured employee's name
(b) Wages earned during payroll period
(c) Number of days worked during payroll period
(d) Total number of hours worked during payroll period
(e) Full scheduled hours per week for employees or group of employees
(f) Date when employee quits or is "laid-off," either permanently or temporarily, or is discharged
(g) Date employee is hired, or reinstated after "lay-off," or is rehired
(h) Place of employment (city or town)

The second instruction states that an employer covered by the New York Law should submit an initial statement with certain general information about the employing organization. This statement is for the purpose of employer registration and does not require the reporting of individual employee data. As already stated, individual employee data will not be required prior to April 1, 1936, and if the Legislature concurs in the aforementioned recommendation, they will not be required before January 1, 1937. Meanwhile, detailed instructions can be prepared covering such employee reports.

The problems of Unemployment Insurance in New York are not confined to issues arising solely within the borders of this State, they involve also relationships with other States and particularly with the Federal Social Security Board and other Federal agencies. The situation with which all States are faced as regards consistency of rulings in the various States and interpretations consistent with the views of the Federal authorities is indeed a serious one.

The issue of centralization versus decentralization of control over unemployment insurance is only beginning to be recognized. It is the old issue of States' rights standing out against concentration of control in Washington. But the form of the question today is the achievement of national standards through agreement by the States as opposed to Congressional determination. An answer to this question as it pertains to unemployment insurance may be expressed during the coming year by the Supreme Court of the United States. The final answer, however, rests during the years to come with the practicalities of the complicated relationships of government with the economic life of its citizens.

Chief among these practicalities are (1) the structural organization of business and industry and (2) the migratory habits of our population. If, for example, there is to be a continuance or further increase in nationwide business enterprise through interstate corporations or comparable agencies, then the application of reasonable and effective national standards and uniform procedures is inevitable. On the other hand, return of American life to a condition of local self-sufficiency

would avoid the problems of interstate economics, commonly called interstate commerce, and would make practical once more a truly local self-government, along State lines. The trend and the logic are clearly in the direction of further development of consistent national standards for unemployment insurance and its administration.

This problem is not one of mere political theory for a soap box oration; it is one of immediate significance to the Unemployment Insurance Administration in New York and in other States. Are we in New York to work out our own treaties of reciprocity with adjoining States and with other States in which New York residents perform their work? Will we be obliged to incorporate the "most favored nation clause" in treaties between the "Sovereign State of New York" and the "Sovereign State of New Jersey" so as to avoid double taxation on the employer of interstate employees? Is an employee to lose his unemployment benefit rights if he moves from one side of the street to the other, thus crossing a State line and changing his State residence? Will there be consistency in interpretative rulings among the States on identical issues?

These are but a few of the questions confronting State administrators. We naturally look to the Federal Social Security Board for guidance and have confidence that the close coöperation of State officials with that Board will produce sane and equable answers to them.

Finally, may it be said that the success of State administration of Unemployment Insurance appears to rest upon broader grounds than the immediate requirements of any State Law. It involves coördination with Federal procedures for Old-Age benefits so as to make possible simplified employer reports and to avoid duplication of employer reports to Federal and State agencies. It will involve a high degree of coöperation on the part of all States with one another under the positive and constructive leadership of the Federal Social Security Board. With this Board, I dare say, all State administrations will be inclined to coöperate to the fullest of their ability, once the way is open to them for the development of effective standards and uniform procedures throughout the United States.

REAL WAGES OF ARTISANS IN LONDON, 1729–1935*

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Probably no subject in the field of economic history is as important in its implications for present policy as the purchasing power of the working classes. It has been studied by many economists, who have accumulated a mass of statistical and non-statistical information, but very few attempts have been made to present the results in the form of an index number, except for the years since 1913. Index numbers, no matter how well constructed, do not furnish a complete picture of any economic problem, but they are desirable as a plane of reference, as a check on scattered quantitative expressions, and as a guide to points or epochs requiring further study. Non-quantitative opinions, even when buttressed by quotations from contemporaries, are inexact and frequently unreliable. People at any time compare conditions with earlier times within their own recollections, and human nature is such that for those who are out of office or out of luck the best that they can remember is the norm, and the present is always a time of depression or retrogression. For those in office or in funds, on the other hand, the present is usually a time of unprecedented progress and prosperity. Each side can present scattered bits of evidence to support its position, and base a social philosophy on the fate of hand-loom weavers or the price of wheat. Doubtless most economists would agree that an accurate knowledge of the purchasing power of the working classes during the industrial revolution is important enough to warrant the preparation of more quantitative checks, guides, and summaries than have yet appeared. Since England was the home of the industrial revolution, and English statistical material more complete in the earlier years, this index has been prepared, referring to wages and prices in London.

As Dr. Gilboy has pointed out, conditions in different parts of England were so diverse that a sound study of wages and prices must be restricted to one locality. It is perhaps not sufficiently realized that a study of the cost of living must also be restricted to commodities entering directly into the cost of living. Even in ordinary times raw materials and consumers' goods have very different movements. In an epoch when methods of production were being drastically changed the divergence between movements of raw material prices and those of

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finished goods must have been even greater. All the index numbers available for England before 1850 are based on raw materials and foods; most are weighted without reference to the relative importance of their components in the consumers' budget; most include imports without allowing for import duties that were added to the price the consumer had to pay. They cannot therefore be relied on as measures of the cost of living or the purchasing power of money, and the attempt to use them for that purpose has led to some very debatable conclusions. Mr. Keynes has pointed out the theoretical reasons for suspecting that indexes of wholesale commodity prices cannot portray accurately the purchasing power of money. The index that I am about to describe confirms his suspicions, for it differs widely from the existing wholesale indexes.

In constructing an index number of commodity prices over a long period one is faced with two problems—one statistical, one economic—which require the same answer. The statistical fact is that there are practically no continuous series of price quotations referring to the same commodity, or the same quality of a commodity, that cover the whole period under review. The economic fact is that many commodities once important became unimportant, and that many once unknown came to occupy an important place in the typical consumer's budget. For example: the substitution of kerosene for candles and its subsequent replacement by gas and later by electricity; or among foods the declining importance of beer and cheese and the increasing importance of tea, cocoa, sugar, and fruits. Foods of all sorts took up a smaller part of the total consumption of workingmen as their condition improved, and manufactured articles and services became more important. The answer to both these problems is found in the construction of a series of indexes, each covering a period of moderate length in which prices are comparable and consumers' habits nearly unchanged, and welding them on to one another to form a continuous chain.

The links in this chain are as follows: 1729–1800; 1790–1818; 1815–1821; 1819–1832; 1828–1835; 1833–1837; 1836–1850; 1847–1862; 1862–1868; 1868–1873; 1870–1880; 1877–1900; and since 1900 the Ministry of Labour indexes of the cost of living. In most cases the links overlapped two, three or four years. In 1862 overlapping was not necessary as the items dropped were unimportant and were replaced by similar ones. In 1868 the nature of the available material for adjoining years made overlapping inadvisable. A supplementary index including all the items continuously available was worked out for 1847, 1850, 1857 and 1873, and it was found to correspond very closely with the chain index. By using this device ordinary interpolation was almost entirely

avoided after 1805. Before 1805 the complete index could only be constructed at five-year intervals, and figures for the intervening years are interpolations based on a smaller number of items.

Each link was a weighted logarithmic average of consumers' goods, i.e., goods that required no further processing than what was customarily performed in the consumers' households. Thus we have bread and flour, but no wheat (except for interpolation before 1735); clothing, cloth, worsted and sewing thread, but no wool, cotton or flax; shoes, but no leather. The weights for the eighteenth century were based on budgets published by Dr. Gilboy. For the first half of the nineteenth century they were based on studies by Wood, Chadwick, Neild, and Lowe, and on the official ration of the Chelsea veterans' hospital. After 1870 the chief authority has been the Ministry of Labour, but the practise of American and Swedish authorities has also been considered, and the relative weight of food is slightly less than in the Ministry of Labour's index, in order to make room for sundry manufactured articles.

The weights of foods aggregated 75 per cent of the total index until 1815, 67 per cent until 1850, and 60 per cent thereafter. Clothing accounted for 14 per cent until 1815, 18 per cent from 1815 to 1850, and 20 per cent after 1850. Fuel and light accounted for 7 per cent before 1815, and 9 per cent after that year. The rest of the items, sundry manufactured articles, varied from 4 per cent to 11 per cent.

Although a complete list of articles quoted, the number of quotations for each, and their weights, cannot be given here in the space allowed, the list for 1729 will give an idea of the representative nature of the index in its least representative period—for in later periods the number and variety of items was much greater. In 1729 there were 18 quotations for food, 7 for clothing, 4 for fuel and light and 2 for sundries. There were 19 individual commodities:—butcher's meat, bread, butter, cheese, peas, oatmeal, beer, malt, hops, salt, coats, shoes, stockings, hats, uniforms, coal, candles, mops, and blankets. Tea, sugar, and tobacco were soon added, then spirits and illuminating oil, and the number of sources for each commodity increased, especially after 1780. The number and variety of items increased so that from 1815 to 1835 there were usually over 100 quotations referring to over 50 distinct commodities, and directly covering probably over 90 per cent of the expenditure of a working-class family other than rent and medical attention. After 1835 the clothing items are less complete but foods are even better represented than before. The index after 1880 is merely a recalculation of the Ministry of Labour index with some manufactured sundries added; and after 1900 the Ministry of Labour indexes

are used with no change except reduction to a common base.

All the prices used are taken either from official reports or from the data used by other compilers of index numbers, such as Silberling, Newmarch, Sauerbeck, Jevons, and the Board of Trade. The chief source from 1729 to 1868 was the record of prices paid for supplies by Greenwich Hospital; from 1729 to 1832 the corresponding prices for Chelsea Hospital were also used; and from 1815 to 1853 similar prices for Bethlem Hospital. After 1853 most of the prices are taken from the Economist or Sauerbeck indexes, or from the Board of Trade's 1903 Report on Wholesale and Retail prices. From 1847 to 1880 sundry manufactures consisted largely of Soetbeer's average of 14 manufactured British exports, which he used in compiling his index of the cost of living in Hamburg. From 1880 to 1900 Silverman's index[1] of British export prices was used to supplement the Ministry of Labour index, since it consists mainly of coal, textiles and sundry manufactures eligible for inclusion in a list of consumers' goods.

In this manner an index of prices of consumers' goods was attained. It is not a complete index of the cost of living, for it omits services, including the services of retailers, and it omits rents. Rents are certainly important, but there is no way to ascertain directly what they amounted to from year to year. The scattered information compiled by Bowley and Wood and earlier writers seems to support the hypothesis that rents of artisans in London strongly tended to equal one-sixth of their weekly wage. It is reasonable to suppose that rents of workingmen's houses should fluctuate with wages, for wages constitute the chief element in demand, and also an important element in supply. Available figures for prices of building materials do not correlate well with the rents reported; neither do the statistics of interest rates or population density. Consequently in order to cover rents and services not included in the prices of commodities a hypothetical cost-of-living index has been calculated, consisting of the consumers' goods index with a weight of four and wages with a weight of one. A similar average of commodities and wages was used by Arthur Young for the same purpose over a century ago. This hypothetical cost-of-living index is the basis of discussion in the remainder of this paper. If any one prefers he can use the consumers' goods index, and if he does so he will get more extreme fluctuations in real wages and a sharper upward trend from 1800 to 1900.

An index of real wages is of course constructed by dividing an index of money wages by an index of the cost of living. The index of money wages here used is based on compilations by Wood, Bowley, Hirst,

[1] A. G. Silverman, *Review of Economic Statistics*, August 1930. (Vol. XII, p. 139 ff.)

and the Ministry of Labour, and Hardy's figures for artisans employed on public buildings. There are many trades included after 1780, although before 1850 most wage series are available only for selected years, except some series for artisans in the building trades. Here we have four kinds of labor at Greenwich for every year from 1729 to 1868 and at Chelsea from 1807 to 1818. Before 1780 the only available wages were in the building trades, and those used were largely taken from Dr. Gilboy's book, or kindly supplied by her for this index. It is very likely that other wages were not so inflexible, and possibly they had more of a rising trend from 1750 to 1800; it is highly probable that wages of unskilled laborers rose more than wages of artisans, but conclusive evidence is lacking.

So here we have the index of real wages. Before describing its movements and drawing conclusions from it a warning is in order. An index of real wages is not a complete index of the income of the laboring class, still less of its welfare. For one thing, unemployment must be allowed for. However, Wood's study of this point, for the years between 1850 and 1900, shows that allowance for unemployment does not affect the picture very much, and especially does not alter the trend. Bagge's study of real wages in Sweden since 1860 leads to the same conclusion. Of course there are no reliable statistics of unemployment in earlier years. In view of a widespread impression it is worth while mentioning also that unemployment is not invariably greater in years of low prices, although there is a tendency for it to increase for a while when prices decline suddenly.

Another point to bear in mind is that working hours have been reduced from 72 or even 84 a week to 48 or less. Since these indexes are based on weekly wages they greatly underestimate the increase in the purchasing power of an hour's labor. A third point is that in the last hundred years the services rendered by the state have increased greatly in variety and importance. These fall mainly in the field of sanitation, education, and amusement, and cannot be shown by price indexes. Finally the size and comfort of workingmen's dwellings have increased, partly on account of housing laws. On the whole the condition of the laboring class, if it could be represented by a curve, would rise more rapidly from 1832 to the present, with smaller fluctuations.

The index of real wages then measures the ability of a typical, regularly employed London artisan to purchase commodities of the sort artisans customarily purchased. It attempts to measure also his ability to purchase housing. It covers probably more than nine-tenths of his expenditures, which is as large a proportion as any published index number for recent years. But it is only one measure of the welfare of

INDEXES OF PRICES OF CONSUMERS' GOODS, MONEY WAGES, COST OF LIVING, AND REAL WAGES IN LONDON, 1729–1900 (1900 = 100)

Year	Food	Clothing	Fuel and Light	Sundries	Total	Money Wages	Cost of Living	Real Wages
1729	64.8	171.2	89.4	148.3	78.5	42.7	71.4	59.8
30	57.9	168.4	85.1	125.7	72.2	42.2	66.2	63.8
31					62.3	43.1	58.4	72.1
32					60.4	43.1	56.9	75.7
33					65.6	43.1	61.1	70.5
34					69.9	43.1	64.6	66.7
35	54.4	158.0	72.1	127.2	67.6	44.0	62.9	70.0
36					69.2	44.0	64.1	68.6
37					71.7	44.0	66.2	66.5
38					73.2	44.0	67.3	65.4
39					84.7	44.0	76.6	57.4
1740	83.8	157.7	90.1	137.3	95.1	44.0	84.9	51.8
41					77.8	44.0	71.0	60.2
42					76.4	42.4	69.6	60.9
43					71.6	42.7	61.0	70.0
44					71.9	43.6	66.2	65.9
45	68.0	156.0	91.2	140.6	81.3	39.8	73.0	54.6
46					88.2	43.6	78.1	55.8
47					86.7	44.0	77.9	56.5
48					88.8	44.0	79.7	55.2
49					91.3	44.0	81.6	53.9
1750	81.4	155.6	87.9	139.8	92.8	44.0	83.0	53.0
51					102.7	44.0	88.0	50.0
52					97.7	44.0	84.2	52.3
53					100.1	44.0	86.0	51.2
54					83.4	44.0	76.9	57.2
55	74.5	159.0	92.4	137.7	87.3	44.0	78.6	56.0
56					127.0	44.0	100.0	44.0
57					118.4	44.0	95.7	46.0
58					98.1	44.0	85.1	51.7
59					89.8	44.0	80.9	54.4
1760	79.0	158.0	98.1	140.9	91.6	44.0	82.0	53.7
61					86.6	44.0	78.1	56.3
62					90.8	44.0	81.4	54.1
63					88.2	42.2	79.0	53.4
64					91.1	44.0	81.7	53.8
65	82.8	160.3	94.5	141.4	95.4	44.0	85.1	51.7
66					97.1	44.0	86.5	50.9
67					100.8	44.0	89.4	49.2
68					99.7	44.0	88.6	49.1
69					91.8	44.0	82.2	53.5
1770	85.0	135.7	94.3	148.1	94.5	44.0	84.4	52.1
71					101.8	44.0	90.2	48.8
72					109.7	44.0	96.6	45.5
73					109.9	44.0	96.7	45.5
74					107.5	44.0	94.8	46.4
75	95.6	129.4	88.3	158.8	102.6	44.0	90.8	48.5
76					93.9	44.0	84.0	52.4
77					103.9	44.0	91.9	47.9
78					99.4	44.0	88.3	49.8
79					94.0	44.0	84.0	52.4
1780	88.1	131.3	107.5	164.2	98.1	44.0	79.3	55.5
81					106.6	44.0	94.1	46.7
82					111.4	44.0	98.0	44.9
83					110.4	44.0	97.1	45.3
84					107.5	44.0	94.8	46.4
85	96.4	130.4	107.5	164.2	105.0	44.0	92.9	47.4
86					101.8	44.0	90.2	48.8
87					102.4	44.0	90.7	48.5
88					102.0	44.0	90.4	48.7
89					105.1	44.0	92.9	47.4
1790	101.6	137.5	111.0	160.7	111.1	45.1	97.9	46.1
91					107.7	45.1	95.2	47.4
92					106.1	45.1	93.9	48.0
93					113.3	45.9	99.8	46.0
94					115.2	46.7	101.5	46.1

Year	Food	Clothing	Fuel and Light	Sundries	Total	Money Wages	Cost of Living	Real Wages
95	127.5	136.4	147.7	194.1	134.6	48.6	116.7	41.4
96					133.6	49.4	116.8	42.3
97					130.8	51.0	115.4	44.2
98					132.5	51.1	116.3	43.9
99					144.0	51.1	125.5	40.9
1800	189.9	152.6	162.5	236.8	183.1	51.1	156.7	32.6
01					186.2	52.6	159.5	33.0
02					155.9	53.1	135.4	39.2
03					161.6	53.3	139.9	38.1
04					163.0	53.7	141.2	38.0
05	181.8	172.0	166.5	227.2	180.6	54.8	155.5	35.2
06	176.4	169.0	160.2	213.8	175.6	54.8	151.4	36.2
07	147.4	150.6	160.5	213.2	173.5	60.8	151.0	40.3
08	186.1	153.4	187.4	229.3	182.8	63.0	158.9	39.6
09	207.6	166.6	199.8	237.3	201.9	64.2	174.2	36.9
1810	207.6	166.8	192.6	236.7	201.9	66.5	174.4	38.2
11	205.1	164.4	189.8	233.6	198.9	69.5	173.0	40.2
12	231.7	168.6	191.2	229.3	219.1	69.5	189.2	36.7
13	234.7	165.5	201.1	244.1	225.4	70.0	194.4	36.0
14	198.4	184.8	207.2	356.9	201.8	70.6	175.5	40.2
15	174.0	188.8	178.4	315.1	180.6	70.6	158.6	44.5
16	171.3	185.6	148.4	303.2	176.2	67.3	154.4	43.6
17	188.6	163.2	158.6	266.4	181.4	66.4	158.4	41.9
18	184.8	166.0	162.3	293.7	183.3	66.4	160.0	41.5
19	178.3	176.5	155.9	259.2	180.2	65.1	157.2	41.4
1820	166.1	172.4	138.2	237.1	168.7	64.7	148.0	43.7
21	144.8	181.9	128.1	238.2	153.7	65.4	136.0	48.7
22	125.3	166.2	123.0	250.7	136.4	65.4	122.2	53.5
23	132.1	155.0	119.4	241.5	139.0	65.4	124.2	52.7
24	139.9	150.2	109.4	209.2	141.2	66.1	126.2	52.4
25	156.7	150.9	125.5	191.9	154.5	66.9	137.0	48.8
26	150.2	148.1	121.4	188.5	148.1	66.1	131.7	50.2
27	143.9	155.4	121.5	184.0	145.0	66.2	129.3	51.2
28	139.2	148.9	115.8	183.0	140.1	65.9	125.2	52.6
29	139.2	138.6	110.6	177.1	137.4	64.3	122.8	52.4
1830	128.1	137.5	106.3	167.4	128.9	65.3	116.2	56.2
31	137.9	147.8	99.5	156.1	137.9	63.3	122.9	51.5
32	133.6	156.2	99.6	162.1	135.5	63.2	121.0	52.2
33	129.3	137.7	83.0	166.3	128.1	63.4	115.2	55.0
34	118.8	145.3	82.0	177.7	122.6	63.5	110.8	57.3
35	113.2	150.2	84.9	181.2	120.6	62.3	108.9	57.2
36	124.3	149.1	87.6	182.1	127.8	61.3	114.5	53.5
37	135.2	147.5	100.4	172.5	136.5	61.2	121.4	50.4
38	135.5	144.8	100.1	162.4	135.7	61.2	121.6	50.3
39	153.7	145.4	104.7	162.5	148.3	61.2	130.9	46.7
1840	144.0	141.3	97.8	161.0	140.3	61.2	124.5	49.2
41	152.2	141.6	97.7	161.5	145.7	61.6	128.6	47.9
42	138.8	136.2	95.5	152.4	125.3	61.6	112.6	54.7
43	124.3	130.4	92.3	149.0	124.1	61.7	111.6	55.3
44	123.8	132.6	87.3	145.1	123.3	61.9	111.0	55.8
45	131.2	133.0	89.0	144.3	128.4	61.2	115.0	53.2
46	151.7	142.6	81.5	153.0	142.7	61.6	126.5	48.7
47	159.4	140.8	92.5	150.6	149.5	61.6	131.9	46.7
48	139.2	134.9	88.8	139.4	132.6	61.6	118.4	52.0
49	128.9	131.6	84.0	139.2	125.4	62.1	112.7	55.1
1850	118.5	135.0	78.5	141.1	119.2	62.6	107.9	58.0
51	115.8	140.5	73.3	130.5	117.0	63.0	106.2	59.3
52	115.9	125.6	73.6	131.1	114.5	64.0	104.4	61.3
53	136.1	131.3	83.4	135.1	129.2	66.0	116.5	56.7
54	148.4	129.4	103.2	130.1	137.8	66.6	123.5	53.9
55	151.7	128.3	97.7	127.8	138.4	67.3	124.2	54.2
56	153.6	128.7	96.0	128.4	140.6	67.4	126.0	53.5
57	150.9	132.9	93.2	132.2	138.8	67.3	124.5	54.1
58	127.9	135.9	96.5	130.6	126.5	67.3	114.6	58.7
59	135.8	139.1	90.0	135.6	131.4	68.0	118.7	57.3
1860	140.5	146.8	91.4	131.7	135.7	68.3	122.2	55.9
61	147.5	138.5	94.5	134.3	138.5	69.1	124.6	55.5
62	143.8	148.0	90.0	143.8	140.2	70.2	126.2	55.6
63	139.7	156.2	85.2	159.8	139.8	71.2	126.1	56.5
64	141.0	151.2	86.3	172.0	141.0	71.7	127.2	56.4

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58					98.1	44.0	85.1	51.7
59					89.8	44.0	80.9	54.4
1760	79.0	158.0	98.1	140.9	91.6	44.0	82.0	53.7
61					86.6	44.0	78.1	56.3
62					90.8	44.0	81.4	54.1
63					88.2	42.2	79.0	53.4
64					91.1	44.0	81.7	53.8
65	82.8	160.3	94.5	141.4	95.4	44.0	85.1	51.7
66					97.1	44.0	86.5	50.9
67					100.8	44.0	89.4	49.2
68					99.7	44.0	88.6	49.1
69					91.8	44.0	82.2	53.5
1770	85.0	135.7	94.3	148.1	94.5	44.0	84.4	52.1
71					101.8	44.0	90.2	48.8
72					109.7	44.0	96.6	45.5
73					109.9	44.0	96.7	45.5
74					107.5	44.0	94.8	46.4
75	95.6	129.4	88.3	158.8	102.6	44.0	90.8	48.5
76					93.9	44.0	84.0	52.4
77					103.9	44.0	91.9	47.9
78					99.4	44.0	88.3	49.8
79					94.0	44.0	84.0	52.4
1780	88.1	131.3	107.5	164.2	98.1	44.0	79.3	55.5
81					106.6	44.0	94.1	46.7
82					111.4	44.0	98.0	44.9
83					110.4	44.0	97.1	45.3
84					107.5	44.0	94.8	46.4
85	96.4	130.4	107.5	164.2	105.0	44.0	92.9	47.4
86					101.8	44.0	90.2	48.8
87					102.4	44.0	90.7	48.5
88					102.0	44.0	90.4	48.7
89					105.1	44.0	92.9	47.4
1790	101.6	137.5	111.0	160.7	111.1	45.1	97.9	46.1
91					107.7	45.1	95.2	47.4
92					106.1	45.1	93.9	48.0
93					113.3	45.9	99.8	46.0
94					115.2	46.7	101.5	46.1

Year	Food	Clothing	Fuel and Light	Sundries	Total	Money Wages	Cost of Living	Real Wages
95	127.5	136.4	147.7	194.1	134.6	48.6	116.7	41.4
96					133.6	49.4	116.8	42.3
97					130.8	51.0	115.4	44.2
98					132.5	51.1	116.3	43.9
99					144.0	51.1	125.5	40.9
1800	189.9	152.6	162.5	236.8	183.1	51.1	156.7	32.6
01					186.2	52.6	159.5	33.0
02					155.9	53.1	135.4	39.2
03					161.6	53.3	139.9	38.1
04					163.0	53.7	141.2	38.0
05	181.8	172.0	166.5	227.2	180.6	54.8	155.5	35.2
06	176.4	169.0	160.2	213.8	175.6	54.8	151.4	36.2
07	147.4	150.6	160.5	213.2	173.5	60.8	151.0	40.3
08	186.1	153.4	187.4	229.3	182.8	63.0	158.9	39.6
09	207.6	166.6	199.8	237.3	201.9	64.2	174.2	36.9
1810	207.6	166.8	192.6	236.7	201.9	66.5	174.4	38.2
11	205.1	164.4	189.8	233.6	198.9	69.5	173.0	40.2
12	231.7	168.6	191.2	229.3	219.1	69.5	189.2	36.7
13	234.7	165.5	201.1	244.1	225.4	70.0	194.4	36.0
14	198.4	184.8	207.2	356.9	201.8	70.6	175.5	40.2
15	174.0	188.8	178.4	315.1	180.6	70.6	158.6	44.5
16	171.3	185.6	148.4	303.2	176.2	67.3	154.4	43.6
17	188.6	163.2	158.6	266.4	181.4	66.4	158.4	41.9
18	184.8	166.0	162.3	293.7	183.3	66.4	160.0	41.5
19	178.3	176.5	155.9	259.2	180.2	65.1	157.2	41.4
1820	166.1	172.4	138.2	237.1	168.7	64.7	148.0	43.7
21	144.8	181.9	128.1	238.2	153.7	65.4	136.0	48.7
22	125.3	166.2	123.0	250.7	136.4	65.4	122.2	53.5
23	132.1	155.0	119.4	241.5	139.0	65.4	124.2	52.7
24	139.9	150.2	109.4	209.2	141.2	66.1	126.2	52.4
25	156.7	150.9	125.5	191.9	154.5	66.9	137.0	48.8
26	150.2	148.1	121.4	188.5	148.1	66.1	131.7	50.2
27	143.9	155.4	121.5	184.0	145.0	66.2	129.3	51.2
28	139.2	148.9	115.8	183.0	140.1	65.9	125.2	52.6
29	139.2	138.6	110.6	177.1	137.4	64.3	122.8	52.4
1830	128.1	137.5	106.3	167.4	128.9	65.3	116.2	56.2
31	137.9	147.8	99.5	156.1	137.9	63.3	122.9	51.5
32	133.6	156.2	99.6	162.1	135.5	63.2	121.0	52.2
33	129.3	137.7	83.0	166.3	128.1	63.4	115.2	55.0
34	118.8	145.3	82.0	177.7	122.6	63.5	110.8	57.3
35	113.2	150.2	84.9	181.2	120.6	62.3	108.9	57.2
36	124.3	149.1	87.6	182.1	127.8	61.3	114.5	53.5
37	135.2	147.5	100.4	172.5	136.5	61.2	121.4	50.4
38	135.5	144.8	100.1	162.4	135.7	61.2	121.6	50.3
39	153.7	145.4	104.7	162.5	148.3	61.2	130.9	46.7
1840	144.0	141.3	97.8	161.0	140.3	61.2	124.5	49.2
41	152.2	141.6	97.7	161.5	145.7	61.6	128.6	47.9
42	138.8	136.2	95.5	152.4	125.3	61.6	112.6	54.7
43	124.3	130.4	92.3	149.0	124.1	61.7	111.6	55.3
44	123.8	132.6	87.3	145.1	123.3	61.9	111.0	55.8
45	131.2	133.0	89.0	144.3	128.4	61.2	115.0	53.2
46	151.7	142.6	81.5	153.0	142.7	61.6	126.5	48.7
47	159.4	140.8	92.5	150.6	149.5	61.6	131.9	46.7
48	139.2	134.9	88.8	139.4	132.6	61.6	118.4	52.0
49	128.9	131.6	84.0	139.2	125.4	62.1	112.7	55.1
1850	118.5	135.0	78.5	141.1	119.2	62.6	107.9	58.0
51	115.8	140.5	73.3	130.5	117.0	63.0	106.2	59.3
52	115.9	125.6	73.6	131.1	114.5	64.0	104.4	61.3
53	136.1	131.3	83.4	135.1	129.2	66.0	116.5	56.7
54	148.4	129.4	103.2	130.1	137.8	66.6	123.5	53.9
55	151.7	128.3	97.7	127.8	138.4	67.3	124.2	54.2
56	153.6	128.7	96.0	128.4	140.6	67.4	126.0	53.5
57	150.9	132.9	93.2	132.2	138.8	67.3	124.5	54.1
58	127.9	135.9	96.5	130.6	126.5	67.3	114.6	58.7
59	135.8	139.1	90.0	135.6	131.4	68.0	118.7	57.3
1860	140.5	146.8	91.4	131.7	135.7	68.3	122.2	55.9
61	147.5	138.5	94.5	134.3	138.5	69.1	124.6	55.5
62	143.8	148.0	90.0	143.8	140.2	70.2	126.2	55.6
63	139.7	156.2	85.2	159.8	139.8	71.2	126.1	56.5
64	141.0	151.2	86.3	172.0	141.0	71.7	127.2	56.4

Year	Food	Clothing	Fuel and Light	Sundries	Total	Money Wages	Cost of Living	Real Wages
65	138.6	148.1	87.7	166.3	139.1	73.3	126.0	58.2
66	147.0	142.8	98.6	172.5	145.0	75.9	131.2	57.9
67	151.6	138.4	96.6	165.5	145.5	76.9	131.8	58.3
68	151.4	130.5	94.5	156.9	143.7	76.7	130.3	58.9
69	136.0	134.0	91.7	157.4	135.2	76.8	123.6	62.1
1870	135.1	128.4	92.4	151.7	131.0	79.0	120.6	65.5
71	141.9	126.3	90.7	151.8	134.6	81.0	123.9	65.4
72	144.9	134.0	105.7	159.2	140.0	84.1	128.7	65.3
73	141.8	135.1	121.2	157.7	139.7	86.8	129.1	67.2
74	136.0	132.2	104.4	123.1	130.5	88.2	122.0	72.3
75	129.9	133.3	97.5	120.8	126.5	88.1	118.8	74.2
76	132.7	124.3	96.3	114.6	124.3	87.7	117.0	75.0
77	133.2	119.9	92.5	109.9	123.4	86.7	116.1	74.7
78	128.2	114.1	83.6	106.5	117.7	82.8	110.7	74.8
79	123.1	107.0	81.6	100.9	112.4	83.2	106.6	78.0
1880	122.4	112.9	74.1	103.5	113.4	83.1	107.4	77.4
81	121.2	108.5	77.0	96.0	110.9	84.6	105.7	80.0
82	121.2	107.5	73.0	96.1	110.2	85.6	105.3	81.3
83	121.1	105.1	75.7	91.1	109.5	85.9	104.8	82.0
84	113.9	102.7	75.1	87.9	104.0	85.2	100.2	85.0
85	106.9	102.1	75.1	82.9	99.8	83.8	96.6	86.7
86	103.4	102.2	73.2	79.5	97.2	83.1	94.3	88.1
87	100.2	102.2	71.5	81.3	95.4	83.3	93.0	89.6
88	100.0	100.8	72.9	83.8	95.5	85.0	93.4	91.0
89	103.2	100.4	73.9	89.7	98.1	87.6	96.0	91.3
1890	101.6	101.8	79.6	95.6	98.8	90.8	97.2	93.4
91	103.7	101.9	78.2	88.1	99.0	91.1	95.8	95.1
92	103.9	101.0	77.7	80.5	97.9	90.5	96.4	93.9
93	99.3	100.3	84.5	80.5	96.2	90.5	95.1	95.2
94	94.9	99.1	73.4	75.8	91.3	90.5	91.1	99.3
95	92.1	97.8	71.3	72.5	88.7	90.5	89.1	101.6
96	91.7	98.6	72.1	73.9	88.8	91.1	89.3	102.0
97	95.5	98.2	72.6	72.4	88.8	93.1	89.7	103.8
98	99.5	97.0	73.3	75.3	93.4	93.3	93.4	100.2
99	95.4	96.2	79.5	84.3	92.7	96.0	93.4	102.2
1900	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
01	100.4	100.6	89.0		99.5	99.1	99.5	99.6
02	101.0	99.9	84.6		99.5	97.9	99.5	98.4
03	102.8	99.7	80.9		100	97.4	100	97.4
04	102.4	102.3	79.4		100	96.9	100	96.9
05	102.8	103.0	78.4		101	97.3	101	96.3
06	102.0	104.5	79.5		100.5	98.7	100.5	98.2
07	105.0	106.2	88.9		103	102.2	103	99.2
08	107.5	107.1	85.6		105	101.6	105	97.3
09	107.6	108.4	84.1		105	100.4	105	95.6
1910	109.4	110.7	83.8		106	100.8	106	95.1
11	109.4	112.4	85.1		106.5	101.1	106.5	94.9
12	114.5	115.5	87.0		110	103.7	110	94.3
13	114.8	115.9	90.7		111	106.8	111	96.2
14	116.8	117.4	92.5		115.5	107.8	115.5	93.1
15	147.4	142.3	115.9		135	119.7	135	88.5
16	180.0	183.7	127.7		161	130.2	161	81.1
17	223.3	241.5	137.8		194	167.0	194	86.3
18	241.9	362.8	165.3		223	209.0	223	93.6
19	246.4	422.6	183.4		236	233.0	236	98.5
1920	288.0	485.3	201.4		274	271.7	274	99.2
21	258.2	353.5	230.4		249	260.6	249	104.8
22	198.0	275.3	221.1		201	203.3	201	101.0
23	190.1	259.6	211.4		191	181.9	191	95.0
24	191.2	262.5	213.8		192	184.8	192	96.0
25	192.4	267.2	217.6		194	188.4	194	97.3
26	184.5	257.8	194.8		189	186.8	189	98.7
27	180.0	249.7	173.9		184	186.4	184	101.2
28	176.6	255.5	160.6		183	183.1	183	100.3
29	173.2	254.3	162.5		180	182.8	180	101.3
1930	163.1	246.2	163.9		174	182.0	174	104.7
31	147.4	228.7	165.3		162	178.2	162	109.9
32	141.7	220.5	163.4		158	174.6	158	110.2
33	135.0	214.7	161.5		154	173.7	154	112.8
34	137.2	217.6	161.5		155	173.9	155	111.9
35	144.0	215.8	161.5		156	174.5	156	112.2

the working class and has to be supplemented by statistics of mortality, health, education, housing, and employment and by non-statistical evidence.

Subject to these qualifications what does the index show? From 1732 to 1756 a downtrend in real wages, caused not by declining money wages but by increased costs of food and fuel. Clothing fell in price with the extension of the factory system, even before the introduction of steam or water-driven machinery.

From 1756 to 1793 the trend was horizontal, but after 1793 real wages fell rapidly, as war and fiat money made commodity prices rise. Peace and restoration of the gold standard raised real wages to the level that had prevailed from 1750 to 1780. Food went up much more than clothing during the war, as machinery reduced factory costs while agriculture continued to struggle against the law of diminishing returns as the population increased and the area of cultivation was extended to include inferior soils.

Money wages fell after 1815, but more slowly than the cost of living, with the result that real wages rose. By 1836 the downtrend of money wages was halted, but crop failures in 1839, 1841, and 1846 so raised the cost of living that real wages turned down again until 1847. Then began an uptrend in money wages that continued until 1873 without a setback and resumed its progress in 1887. Real wages, though interrupted by the Crimean War, rose rapidly after 1847, and unlike money wages did not react in the seventies and eighties. They reached a peak in 1897 that was not again attained until after the War. That peak was over twice the level of 1847 and over three times the level of 1800. But after 1897 money wages did not keep pace with the cost of living, and only caught up in the post-war deflation. Since 1929, on the other hand, money wages have not fallen as fast as the cost of living, and the index of real wages is now about 8 per cent above its 1897 peak. This difference is probably not enough to offset the higher rate of unemployment. On the other hand, the workingman, whether employed or not, gets much more from the public funds now than then, and working hours are shorter.

It is interesting to compare this index with the indexes of real wages in Sweden since 1860 and in this country since 1790—the only similar indexes of which I am aware.[2]

The long trend of real wages in England from 1791 to 1900 was not greatly different from the trend in this country. But the rise was more rapid in the United States before 1860, and in England after 1860.

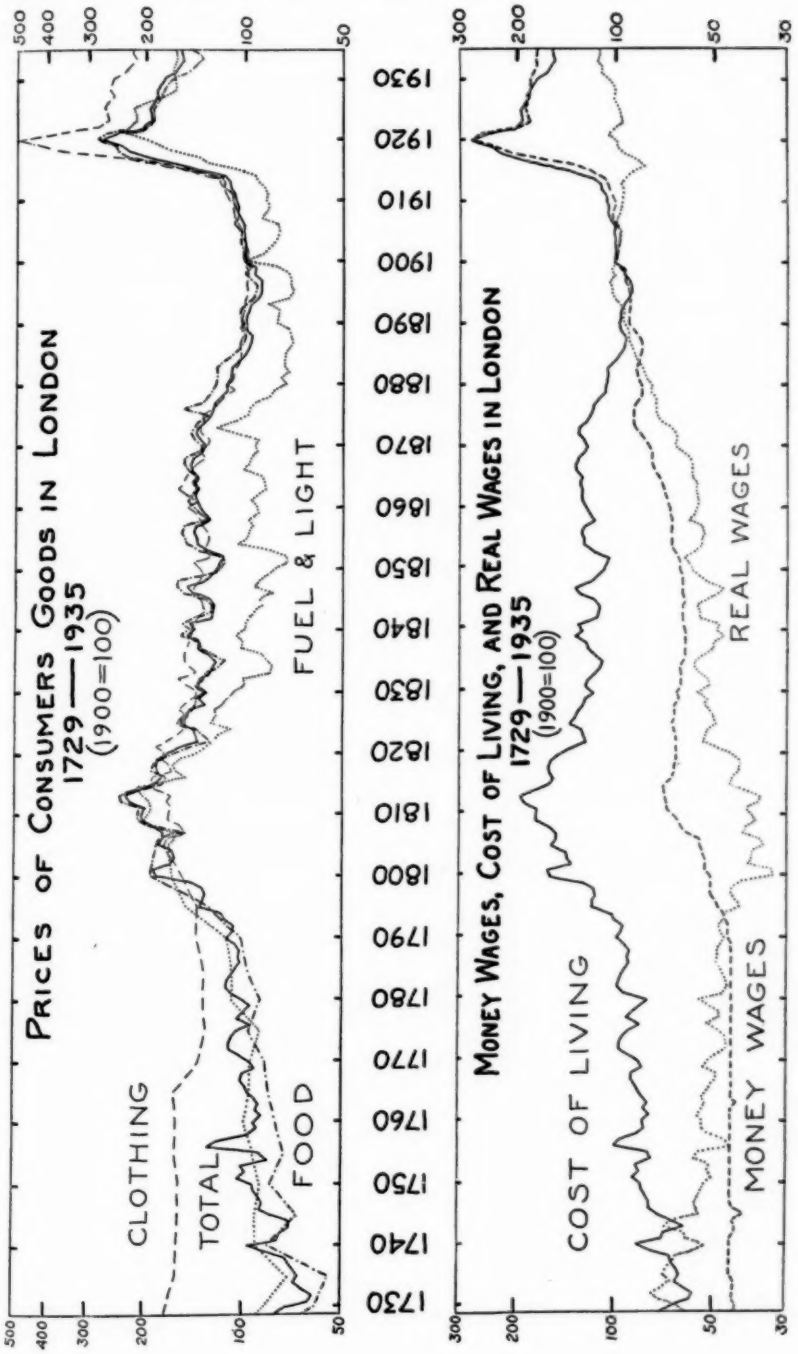
[2] G. Bagge, *Wages in Sweden, 1860–1930;* and an article by the present writer in *Review of Economic Statistics*, Jan. and Feb. 1934. (Vol. XVI, pp. 8–16, 25–27.)

Also there is a strong resemblance between the trend of real wages in Sweden and in England from 1860 to 1900. The lack of improvement since 1900 in England is, however, in striking contrast to the great increase in real wages here and in Sweden from 1918 to 1929.

Many conclusions may be suggested by a study of these indexes, and many explanations offered. One striking fact stands out and may be more than a coincidence. During the eighteenth century real wages in England declined. England like all of western Europe was ruled by a government that thought it its duty to control economic activities. The fashionable philosophy was in favor of economic planning. China was the model and inspiration for amateur social scientists because economic planning was supposed to have reached there its highest degree. Mercantilism was the creed of the business man, and the balance of trade was a constant source of anxiety. Nearly all branches of industry were closely regulated by law, except cotton manufacture. Under those circumstances the population increased, but the purchasing power of laborers fell to such a degree that it was probably no higher in 1800 than in the days of Diocletian 1500 years before. But cotton manufacture expanded and progressed.

After 1776 the up-to-the-minute publicists all came out for laissez-faire and by 1815 the new attitude had even come to pervade governmental and trade circles. Restrictions on industry and trade were gradually abolished, and the tariff was reduced, especially in 1846, although free trade was not finally introduced until 1860. A glance at the chart shows how rapidly real wages rose after that date.

Aside from the general trend of real wages shown by this index the most interesting feature is the timing of important recessions. Every recession was plainly more a result of rising costs of living than of falling money wages. In fact money wages rarely fell before 1921, and almost never as fast as the cost of living. On the other hand when the cost of living rose money wages almost always lagged behind, and real wages therefore fell. This was conspicuously the case during the early part of the Napoleonic and World Wars. Other periods of distress were caused by high prices of agricultural products occasioned by crop failures, especially in the nineteenth century. The last example of a real famine or an approach to one in time of peace was in 1847 when the index of consumers' goods was at its highest point between 1825 and 1916. After 1847 consumers' goods fell rapidly in price until 1852, and never regained their loss until the World War, although in 1866 and 1867 they came close to doing so. Prices of consumers' goods were apparently not affected by the gold discoveries. They were regularly much less affected by cyclical credit expansions than were the prices of raw


PRICES OF CONSUMERS GOODS IN LONDON
1729—1935
(1900=100)
CLOTHING
TOTAL
FOOD
FUEL & LIGHT
MONEY WAGES, COST OF LIVING, AND REAL WAGES IN LONDON
1729—1935
(1900=100)
COST OF LIVING
MONEY WAGES
REAL WAGES
1730
1740
1750
1760
1770
1780
1790
1800
1810
1820
1830
1840
1850
1860
1870
1880
1890
1900
1910
1920
1930

materials. In fact the movements of raw materials and those of finished goods differed greatly both in their fluctuations and in the slope of their trends. In 1782, for example, the first year for which comparisons are possible, the usual combination of Jevons' and Sauerbeck's indexes gives 162 as the level, if 1900 equals 100. This index of consumers' goods gives 111 for that year. At the peak of the Napoleonic period the Jevons-Sauerbeck index is 262, while this index is only 225. In 1849 the Jevons-Sauerbeck index is 107, while this index is 125. In 1873 the Sauerbeck index is 148 while this is 140. During the World War consumers' goods rose only two-thirds as far as raw materials, and since 1920 have fallen only two-thirds as far.

In conclusion I wish to state what seems to me to be the most important fact shown by the index. It is that while the purchasing power of laborers has been increased threefold or more since 1800, this increase has taken place almost entirely in periods when commodity prices were falling. All that increases in money wages have accomplished is to maintain those gains in part when prices rose again. This is statistical support for the thesis recently propounded by Dr. Moulton, that the aim of society should be to reduce prices, not to raise them. The essential soundness of this conclusion does not depend on the absolute accuracy of these statistics. It is supported by every index of real wages that has ever come to my attention. That being the case, I end with a prayer that the politicians who control our destinies may see the light and cease attempting to bring back prosperity by raising prices.

PRICE STABILITY AND RESPONSIVENESS TO CHANGES IN THE PRICE OF GOLD*

By Paul M. Densen

The purpose of this part of the general study of price reactions concerns itself with the answer to the question: Does the degree of stability possessed by the price of a commodity influence the responsiveness of its price to changes in the price of gold?

We shall define one or two terms before going further in order to avoid ambiguity later on. Commodity prices possessing the characteristic of flexibility are those having the ability to follow movements in the general price level over a period of time. A measure of flexibility would be the relative magnitude of price change of the commodity in a given period in which the general price level was changing rapidly. Those commodities experiencing little or no change in magnitude of price would be considered inflexible.

By contrast, instability or volatility of prices is measured by the *frequency* of price changes over a period of time. The greater the number of changes during the given period, the more unstable the price.

The prices we shall employ for analysis in this paper are those which are used in the Bureau of Labor Statistics Index of Wholesale Prices.

Professor Gardiner Means has shown that different commodities differ tremendously in price stability or volatility.[1] He has shown also that this factor is very closely correlated with the flexibility of the price of a commodity. The greater the flexibility or magnitude of price change, the more volatile and the less stable is the price. Mr. Wofsey and Mr. Shapiro have just told you of their findings which indicate that those prices which went down the most in the depression, were also the ones which recovered the most during the period when the price of gold was being changed by government action. In other words, those commodities possessing the greatest degree of flexibility responded most completely to changes in the price of gold.

The fact that stability is so closely correlated, although inversely, with flexibility, makes it difficult to determine whether or not volatility by itself makes the price of a commodity unusually responsive to changes in the price of gold. For example, does the fact that the wholesale price of California gasoline changed 86 times in the 94 months for

* A paper presented at the Ninety-seventh Annual Meeting of the American Statistical Association, New York City, December 31, 1935.

[1] Means, G. C. "Industrial Prices and Their Relative Inflexibility," *Senate Document No. 13. 74th Congress, 1st Session.*

which quotations were recorded, indicate anything about its probable reaction to changes in the price of gold? Did its tendency to hop up and down like a monkey on a stick tend to make it more responsive to the Administration's gold price policy?

In order to answer these questions it was first necessary to eliminate the factor of flexibility so as to permit the independent analysis of stability. This was accomplished by grouping the commodities into classes reasonably homogeneous as regards price flexibility. (The ratio of the average monthly price in 1932 to the average monthly price in 1929 was used as the criterion of flexibility.) The range permitted within any one class was 5 per cent. The commodities were distributed among five such classes, each with a different degree of flexibility.

A scatter diagram was then plotted for each of these five classes. In each diagram, the number of price changes in 94 opportunities for change was plotted on the horizontal axis against the ratio of the March 1934 price to the March 1933 price on the vertical axis, the latter being our measure of price change caused by the change in the price of gold—a change which took place between these two dates.

An examination of the five scatter diagrams leads us to the conclusion that there is not a sufficient degree of correlation present to justify any statement that volatility, or stability, of itself, is a determining factor to any appreciable extent in the responsiveness of the price of a commodity to changes in the price of gold.

There is a correlation present in Charts 1 and 2 that departs significantly from zero but we feel that it is not large enough to consider stability importantly related to commodity price changes due to changes in the price of gold. For the prices in Chart 1 this correlation is 0.397 and for the prices in Chart 2 it is 0.389. Such a correlation means that the variation about the regression of commodity price changes, due to changes in the price of gold, on stability is only 8 per cent less than the variation about the mean of the price changes. The variability of price changes due to changes in the price of gold, as expressed by the standard deviation, is twenty-two units and the consideration of stability reduces this variability only to twenty and one-quarter units. Such a reduction is not large enough, we believe, to justify any great weight being attached to the factor of stability.

Charts 3, 4, and 5 do not exhibit even the slight correlation present in Charts 1 and 2. It is fairly evident that in these three charts there is little relation between stability and price changes due to changes in the price of gold. Summarizing our findings in the light of the evidence here presented, we conclude that the degree of volatility possessed by the price of a commodity is not strikingly related to the responsiveness of that price to changes in the price of gold.

CHARTS 1–5

INDIVIDUAL PRICE CHANGES MARCH 1933 TO MARCH 1934 FOR GROUPS OF COMMODITIES OF SIMILAR PRICE FLEXIBILITY BUT DIFFERENT DEGREES OF PRICE STABILITY

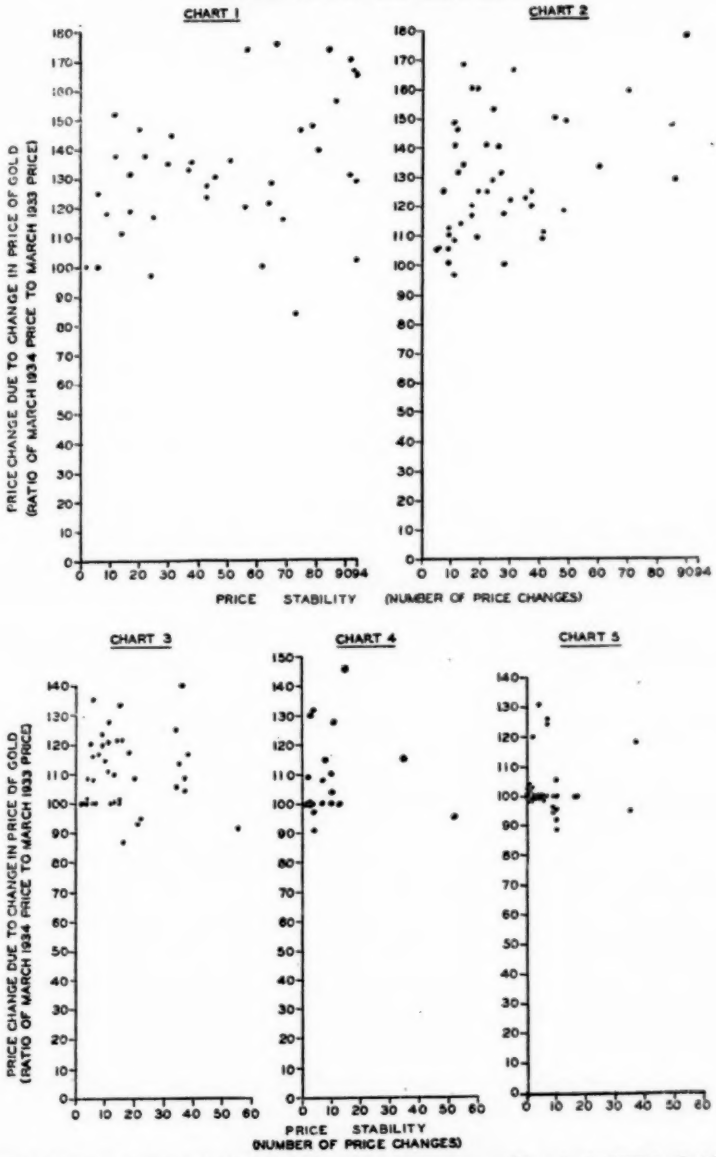


CHART 1
CHART 2
CHART 3
CHART 4
CHART 5
PRICE CHANGE DUE TO CHANGE IN PRICE OF GOLD (RATIO OF MARCH 1934 PRICE TO MARCH 1933 PRICE)
PRICE STABILITY (NUMBER OF PRICE CHANGES)

Chart 1 shows 41 commodities for which the ratio of average monthly price in 1932 to that in 1929 was between 60.0 and 64.9; chart 2, 44 between 70.0 and 74.9; chart 3, 40 between 85.0 and 89.9; chart 4, 26 between 95.0 and 99.9; and chart 5, 50 between 100.0 and 104.9.

STATISTICS RELATING TO SECURITY MARKETS AND CORPORATIONS*

By Paul P. Gourrich, *Director of Research Division*
Securities and Exchange Commission

If I am not grossly to exceed the time allotted me for the discussion of the new statistical material which has become available to the public through the medium of the Securities and Exchange Commission, my remarks must necessarily be confined to a bare enumeration of materials collected, with a few comments on the nature and limitations of the more important series of this data.

The S.E.C., as you know, is a young agency. The fundamental desire of the Commission is to make available to the public statistical data of general interest as rapidly as is consistent with their nature—and it could hardly be otherwise, for full publicity is one of the surest means of achieving the major objectives set up by Congress. But since practically all of our series were started from scratch within the past year, we are still accumulating a considerable body of material which has not been made public because we wish to test its consistency and reliability before doing so.

Other consequences of our short span of existence are that we have not yet been able to utilize to the fullest all of the material which is made available to the Commission in the discharge of its administrative duties, and that there are still wide fields which we had to leave untouched because we necessarily must devote our attention first to those problems most essential to the current administration of the Commission. We hope, therefore, that we will be able to report a year hence almost as large a reservoir of new statistical information as we are reporting today.

Since the administration of the Public Utility Act of 1935 is still too much in its infancy to warrant discussion at the present, I shall consider only those statistics which have resulted from the administration of the Securities Act of 1933 and the Securities Exchange Act of 1934. The statistical materials will be discussed in the following order: I. Published Material; II. Material Not Yet Published; III. Miscellaneous Data.

* A paper presented at the Ninety-seventh Annual Meeting of the American Statistical Association, New York City, December 30, 1935.

PUBLISHED MATERIAL

A. *Monthly Summary of Issues Registered under the Securities Act 1933.* This series—the backbone of the statistical work in the field of new issues of securities—is released about the 20th of each month and covers all publicly offered, non-exempt issues of $100,000 or more, for which a registration statement became effective during the preceding month.[1] Up to November 30, 1935, 1,328 statements had been filed with the Commission covering new issues totaling $4,085,819,000; 913 of these statements, covering new issues totaling $3,508,727,000, became effective under the Act and are contained in this series.

Total effective registrations are divided into two groups: (1) the total for all issues intended in whole or in part for cash sale, and (2) the total for issues to be offered in connection with reorganizations, extension of maturities, and in connection with voting trust arrangements. The totals are broken down to show the distribution according to type of issue (common stock, preferred stock, debentures, etc.) and type of issuer (industry classification). For the first group only, expenses expected to be incurred in distribution (as estimated by the registrants) and the proposed uses of the proceeds are also given. This last item is of great importance, as it serves to indicate just when and by what amounts corporations raise new capital to be used for expansion of their plant and equipment.[2]

In connection with the use of this series it should be borne in mind that all statistics derived from effective registration statements refer to "registered intentions" to sell securities, and do not necessarily represent securities actually offered for sale or sold; and that they represent the registrants' estimates of expected proceeds and contemplated uses of the funds, rather than actual receipts and expenditures. The importance of this limitation is illustrated by the fact that a sample follow-up covering issues which had become effective in a single month (November 1933) disclosed that only a relatively small proportion of the total amount of securities registered had been sold within 16 months after registration. Although there are good reasons for believing that the discrepancy is very much smaller during the present refunding market, a warning must be sounded against using

[1] Securities issued by a common carrier subject to the provisions of Section 20a of the Interstate Commerce Act, bank issues, securities sold exclusively to persons residing within the state of organization of the issuer, securities placed privately, securities issued in certain types of exchanges, etc., are exempt under the 1933 Act.

[2] This release incorporates only a portion of the regularly tabulated material obtained from the registration statements. Within the Commission, the above data, and numerous other items of statistical interest, are tabulated into approximately 90 industrial and financial groups, according to the standard classification used by the Research Division in other studies.

registration statistics indiscriminately to represent or measure the actual volume of new issues absorbed by investors.[3]

B. *Monthly Summary of Trading on Exchanges Registered under the 1934 Act.* About the 25th of each month, the Commission makes public, for each registered securities exchange in the United States, the following data for the preceding month:

1. The number of shares sold, including odd-lots and stopped-stock;
2. The market value of such shares;
3. The par value of bonds sold, including stopped-bonds;
4. The market value of such bonds; and
5. The market value of all securities sold.

These data are reported by the members to the respective exchanges and by the exchanges to the Commission in order to provide a basis for the payment of the tax of 1/500 of 1 per cent on the value of turnover, introduced by Section 31 of the Securities Exchange Act, and cover the period from October 1934.[4] These monthly totals are of interest statistically because they embrace all sales and are, therefore, more comprehensive than "total reported sales"—the figure ordinarily given by newspapers and financial services.

C. *Monthly Summary of Transactions by Officers, Directors, and Principal Stockholders.* Under Section 16(a) of the Securities Exchange Act, officers, directors, and principal stockholders (i.e., persons owning beneficially more than 10 per cent of an issue of equity securities) of corporations with equity securities listed on a national securities exchange are required to report to the Securities and Exchange Commission every month each transaction in all the equity securities of such issuers.

In addition to reports on transactions, these persons are required to report their holdings (on Form 5) when the corporation becomes permanently registered on a national securities exchange (this happened for the majority of listed corporations on July 1, 1935); and (on Form 6) when they become an officer, director, or principal stockholder of the corporation. They must again report their holdings on Form 4 after every change in such holdings. The transactions and the holdings reported on Forms 5 and 6 (with the exception of the approximately 15,000 reports on Form 5 received in July 1935) have been published regularly since March 1935 in the "Official Summary" issued

[3] Another limitation is that the statistics of registrations from July 1933, to August 1934, inclusive, were compiled by the Federal Trade Commission (predecessor to the S.E.C. in the administration of the Securities Act of 1933), and are not comparable with the statistics for later months in all details. Upon taking over the work, the S.E.C. enlarged the scope of the tabulations and changed the method of grouping the proposed uses to be made of the funds. Although this change was made in September 1934, the releases of the Commission were kept on the old basis to the end of 1934.

[4] Similar data for exempt exchanges are also available, but have not thus far been released.

twice a month. Although this material lends itself readily to tabulation, statistical difficulties, some of which are mentioned in the following footnote, have thus far prevented the Commission from making public aggregate figures derived from these reports.[5]

MATERIAL NOT YET PUBLISHED

A. *Comprehensive Series of All New Security Issues.* Statistics derived from registration statements cover only a part, although a relatively large and important one, of all new issues offered in this country. We found the currently available series which purport to cover this field rather incomplete and unsatisfactory for our purposes, and consequently it was felt necessary to construct a comprehensive monthly series of our own for all issues of new securities. The series differs from those currently available particularly in that it (1) includes issues by the U. S. Treasury and its agencies; (2) attempts to include all private placings; (3) tries to distinguish sharply between issues offered for cash and issues offered for exchange or for other consideration; and (4) groups the total net proceeds in several broad categories according to their use, such as purchase of securities, purchase of other assets, expenditures on plant and equipment, repayment of funded debt, repayment of other indebtedness and increase of working capital.[6]

B. *Data Relating to Investment Banking.* An analysis of registration statements also provides us with information on the relation of investment banking to new security issues. Among the data derived are: (1) the type and extent of the banking commitment; (2) the cost of financing and the gross compensation of the underwriters; (3) the

[5] On the average, reports for about 1,700 transactions are received every month by the Commission. The reports not only state the date of the transaction and the amount of securities disposed of by the reporting person, but moreover give some indication as to the relationship of the reporting person to the corporation, the form of ownership and—what is more important—the type of acquisition or disposition reported. The characterization of the type of transaction by the reporting persons is, however, not always as clear as one might wish it to be and it is, therefore, sometimes impossible to distinguish with certainty between market transactions (i.e., purchases and sales on an exchange, on the over-the-counter market or through private deals) and transactions involving no cash consideration such as gifts, exchanges, liquidating dividends and the like. Another difficulty is presented by the fact that a number of transactions are reported by more than one person; this is the case, for instance, with acquisitions or dispositions by a partnership reported by every partner. Therefore, in order to arrive at correct totals it is necessary to eliminate these duplications; but inasmuch as the indications given in the report are not always unambiguous, such totals contain another, although probably not a very serious, source of error.

As for holdings, the S.E.C. is now engaged in the preparation of a "Census of holdings" which will bring together all the reports on Forms 4, 5, and 6, eliminating all but the most recent reports. The "census" will then give a picture of principal stockholders', officers', and directors' holdings in corporations with equity securities on a national securities exchange as of December 31, 1935. Later on we intend to make appropriate deductions for the self-ownership of American corporations (reacquired stock) as well as for inter-company holdings with a view of getting an approximate estimate of the net amount of securities outstanding.

[6] A variety of sources is utilized in securing these data. The data on private placings are based chiefly on questionnaires; those on issues of railroad securities are taken from the dockets of the I.C.C., and those on U.S. Government securities are supplied by the Treasury. For state and municipal issues we have to be content with the series commonly available. With respect to registered issues, only those are included for which there is a record of an actual public offering. This is a necessary statistical "deflation," resulting in the omission of small issues and sales of securities of investment trusts of the open-end type. However, these omissions are probably not so great as to affect the totals to any significant extent.

extent of the employment of and the compensation to dealers in selling the new issues; (4) the amounts of issues originated by or participated in by individual banking houses tabulated on a more accurate basis than that available in the past when participants were credited with the whole of any issue rather than with their respective shares.

C. *Statistics Relating to Corporation Finance.* The registration statements filed under the 1934 Act by companies desiring to list securities on a registered securities exchange afford an invaluable source of information about corporation finance. These statements are available to the public at the Commission's office, and at the exchanges on which the securities are registered. Among other things the registrant is required to give data on the following subjects:

1. Its sales of all securities within three years of the date of registration to any persons other than employees. The required information includes the title of the issue, the date of sale, the aggregate net proceeds, and the names of the underwriters, if any.

2. Information concerning options to which any of the registrant's securities are subject. The prices, expiration dates, and other material conditions relating to the exercise of these options must be described. Names and addresses of persons holding substantial interests in the total option must be given. The consideration for any option granted in the three years prior to registration must be specified.

3. From the majority of the forms for registration under the Securities Exchange Act we have, for the first time, a picture of the complete interest directors, officers, and principal stockholders have in their respective companies since, unlike reports under Section 16, they have to report not only their holdings of equity securities, but all other securities in registered companies of which they act as officers or directors or in which they own more than 10 per cent of any class of equity securities.

4. Some other subjects on which the registrant is required to file information are: (a) officers' remuneration and remuneration to employees who received over $20,000 in the past fiscal year; (b) material bonus and profit-sharing agreements in effect at the time of registration; (c) general effect of all material management and general supervisory contracts in form providing for management of or services to the registrant or any of its subsidiaries, information which is of particular value in connection with public utilities and holding companies; (d) important details of material contracts with underwriters, directors, officers, or principal stockholders; (e) details of substantial changes in the registrants' or its subsidiaries' capitalization such as revaluations, adjustments of reserve accounts, restatements of capital

stock, transfers to and from surplus and write-offs; (f) balance sheets and income accounts.

The financial statements attached to the forms for registration under the Securities Exchange Act of 1934 and the financial statements which will be attached to the corresponding forms for annual reports just released or now in preparation furnish an almost unlimited field for the student of corporation finance, a field which the Securities and Exchange Commission itself has not as yet been able to explore, partly for lack of funds. A first attempt at tabulation and analysis of the annual reports for the fiscal year 1934 is about to be undertaken within the framework of a W.P.A. project—"Census of Listed American Corporations"—which is scheduled to be completed at about the middle of 1936.[7]

At the present time, the only regular statistics worthy of mention maintained by the Commission relating to corporation finance other than those arising out of the Acts are the quarterly earnings of about 300 registered companies, classified according to the industrial grouping previously mentioned. This classification has been carefully worked out with a view to securing a homogeneous functional grouping.

D. *Tabulation of Securities Traded on a Registered Exchange.* There is now in process a tabulation of all securities listed (and/or admitted to unlisted trading privileges) on all registered exchanges. It is intended that these lists will be reviewed once every three months, giving us a quarterly census of issues, by exchanges, by size, and by industries (and possibly also their total market price).

MISCELLANEOUS DATA

The staff of the Commission is continuously engaged in making more or less comprehensive studies on various technical studies which involve the use of new statistics, derived from field investigation or, in some cases, our own statistics. Among these we may note the following: (1) the study of reorganization committees, headed by Professor Douglas; (2) the relationship of pegging and stabilizing to overpricing; (3) options; (4) brokers' solvency; (5) over-the-counter markets; etc.

In connection with these and other studies, several interesting statistical series have been made available to the S.E.C. The New York Stock Exchange reports confidentially the total short position in each

[7] It is the hope of the Commission to make a regular feature of the tabulation of the annual financial statements, which although still far from being completely standardized, will be decidedly more amenable to comparison than the statements made public hitherto by the corporations. This would provide the investor and the student of corporation finance with detailed and extensive material, supplementing the statistics of the Bureau of Internal Revenue which, however, are set up with different purposes in view and therefore are not strictly comparable.

stock listed on the exchange as of the end of the month.[8] These data have been made available to us since July 1933. The Commission has also received various forms from the New York Stock Exchange and the New York Curb Exchange analyzing purchases and sales with respect to the principals involved and the type of transaction. Since the immediate purpose of these reports has been satisfied, they have recently been discontinued, but we shall probably receive some permanent information of this type in the future.

In addition to the above, there are other matters, in connection with which we are compiling information, either for eventual publication, or for use within the Commission. For the most part, these studies are being conducted with a view to making regulations as called for by the statutes.

While these data have been produced in the process of administering the Acts, particularly in connection with the drawing up of regulations, their economic by-products are multitudinous. To give a few illustrations: a study of salaries will enable us to get an idea as to the relation between the payment for managerial talent and total assets or gross revenues in various industries. Stock ownership data should shed light on the question of the extent of interest by officers in their own companies. Data showing trading practices will lift the veil of mystery from the trading process. In connection with proxies (Section 14 of the 1934 Act), we shall have data showing to some degree the extent of harmony or disharmony in corporate life, as well as the extent of ownership of groups intending to bring about a change in management. The periodic reports (Form K-10 and allied forms) will give us for the first time a conclusive picture of the periodic changes in American industry which will lend themselves to broad indexing, since our statistical material will be more or less homogeneous.

In closing, I should like to emphasize the importance of statistics of this sort. The information now available, when properly studied, should enable us to advance a long way in shedding light on our corporate life and in making the financial process less wasteful, more balanced, more responsible, and more orderly. As you know, one of the cornerstones of the 1933 and the 1934 Acts is disclosure. By improving and increasing the fund of statistical knowledge available to the investor, we are progressing towards a fairer financial process, are encouraging the formation of opinion based on facts and not on hunches, and are doing what we can to raise financial standards for the benefit of the investor.

[8] Both exchanges make public the *total* short position in *all* stocks on their respective exchanges as of the end of each month.

SIGNIFICANCE OF THE LENDING FUNCTION OF THE FEDERAL RESERVE BANKS*

By E. A. Goldenweiser, *Director of Research and Statistics Board of Governors of the Federal Reserve System*

Eligibility of paper for discount at the Reserve banks sounds like a highly technical, uninteresting subject. It is a subject, however, that is not only of vital interest to banks at certain times, but one that may be used as a vehicle for expressing a broad general philosophy of banking and of the functions of a central bank. It is from that angle that I propose to approach the subject.

When the Federal Reserve System was established by the Federal Reserve Act in 1913, the prevailing conception of its function was that it was essentially an emergency institution. The Federal Reserve banks, by being given control of the reserves of member banks, were to be placed in a position to lend to these banks for seasonal and emergency purposes, and thereby to prevent periodical stringencies at crop-moving seasons and at other times, which in the past had caused currency and credit panics. The definition of the kind of paper that the Federal Reserve banks could discount was determined by this conception of the functions of the Federal Reserve banks, which is narrow even when viewed apart from the more general central banking duties of these banks. It is narrow even from the point of view of the lending function of the Reserve banks taken by itself. This paper is confined to a discussion of this phase of the Reserve banks' activity.

Limitation of eligibility had a threefold purpose: protection of the assets of the Reserve banks; limitation of the access to be had to these banks; and influence on the member banks in the direction of confining their activities largely to the acquisition of strictly commercial assets, rather than financing long-time enterprises, and particularly speculation. One of the objects of the Federal Reserve System was to prevent the use of member bank reserves in the New York money market, which was considered to be one of the causes of difficulties in earlier days. It is out of this conception of the Federal Reserve System and of the purposes of eligibility that arose the principle that paper in order to be eligible must be self-liquidating. Such paper must arise out of commercial transactions, the means of repayment for which would be

* A paper read before the Ninety-seventh Annual Meeting of the American Statistical Association, New York City, December 30, 1935.

the outcome of the consummation of the transactions for which the loans were made.

The function of eligibility in protecting the assets of the Reserve banks has proved to be essentially unrealistic. Strictly eligible paper can be as bad as or worse than long-time paper. The quality of the paper from the point of view of possible losses can much better be left to the judgment of the Reserve banks and the regulations of the Board, so that adjustments may be made in response to changes in economic and business conditions. The assets of the Reserve banks would be better protected by the provision that they must be satisfactory to the banks than by strict definition, which on the face of it would appear to relieve the banks of some of the responsibility for selecting acceptable assets. The Reserve banks, however, as a matter of fact have never felt themselves relieved of that responsibility, and experience has shown that they can be trusted to use good credit judgment in their operations.

A little aside from the main point of this discussion, but nevertheless not irrelevant, is the question of the volume of holdings of Government securities by the Federal Reserve banks. There is a school of thought that believes that it is bad practice for a Reserve bank to have large holdings of Government securities, and that great dangers are inherent in it. Those who take this point of view recall the great inflations which have been caused by governments borrowing from the central banks. The fact is, as this audience knows very well, that difficulties experienced by Germany and other countries through borrowing from the central bank by the government did not arise from the fact that the central bank held too many government securities, but from the fact that the central bank ceased to function as a regulator of the supply of credit and became an adjunct of the treasury in indirectly issuing fiat money. The real trouble was even deeper than that. It lay in the fact that the country was obliged to meet payments which it was in no position to meet. As a consequence, it had to print money either through the central bank or directly. The fact that it was done through the central bank did not change the ultimate result. It was bound to be inflation in any case. It may be said, in fact, that if inflation does not go too far, it is more likely to be arrested if the money is issued through the central bank than if it is issued directly by the government. A good example of that was war financing in the United States, where the money was raised in part through borrowings from the Reserve banks on the basis of Government obligations. The fact that the borrowing was on notes of the member banks with short maturities helped to bring about the subsequent liquidation.

The point I want to make in this connection is that the foreign instances quoted as horrible examples of inflation caused by a central bank lending to the government are irrelevant when applied to a situation like our own, where the Government's credit is firm, and where the volume of security holdings by the Reserve banks has been determined entirely in accordance with a credit policy adopted by the Reserve authorities for the purpose of encouraging recovery.

This is by way of an aside. Returning to the thread of my story, another purpose of eligibility has been to limit the amount of paper in the hands of member banks on which access to the Reserve banks could be had. This purpose the limitation has never served because at all times there has been vastly more eligible paper, even disregarding Government securities, to assure more access to the Reserve banks than has ever been needed. This statement, of course, applies to the aggregate and not to each individual bank. The principle was, in fact, abandoned when paper secured by Government obligations was made eligible. The reason why this purpose cannot be served by eligibility requirements is that the amount of eligible paper is bound to be plentiful at a time of credit expansion when restraint may be necessary, and the only time when it is likely to be insufficient is at a time when a deflationary process is in progress and when active intervention by the Federal Reserve banks is necessary. Eligibility requirements did not protect the country from the expansion either of 1919 and 1920 or of 1928 and 1929. But they did prevent the Federal Reserve System from coming to the assistance of many individual banks during the period from 1930 to 1932, when many banks were under pressure and had disposed of all of their eligible assets. During that period there were many banks that failed, though they possessed reasonably satisfactory assets, because under the law these assets were not eligible for discount.

This situation had to be met by the passage of the Glass-Steagall Act in 1932, which was at the time an emergency measure, but since has been liberalized and made permanent in the Banking Act of 1935.

The present provision of the law deprives of all significance the idea of limiting access to the Reserve banks by means of eligibility, because it authorizes disregarding eligibility at the only times when such eligibility may actually limit access to the Reserve banks for a considerable number of banks. The necessity for the abandonment of this reason for strict eligibility was made apparent during the depression, and it is safe to say that it will never regain significance.

The other object of eligibility, namely, to be an instrument for improving banking practices and encouraging banks to limit their activi-

ties to commercial paper, would be a more weighty argument, because it would serve a broader purpose, were it not for the fact that the purpose it wishes to serve is entirely unattainable and presumably undesirable in our banking structure. Banks cannot make a living by dealing in commercial paper alone. Such paper only constitutes about 8 per cent of their earning assets and there is not enough of it available to make a living for the banks. Whatever may be said of the desirability of a separation between commercial banking and investment banking, that is not what has emerged from our banking history, and it cannot be accomplished for the great mass of our banks so long as we have a large number of small banks which must serve all the needs of their communities. They could not make a living by doing only commercial business, nor in many cases by doing only investment business. They have to receive both time and demand deposits and they must invest their funds both in long- and short-time paper.

As has become generally known, and has been frequently pointed out, the method of doing business in this country to an increasing extent through corporations has resulted in large industries not borrowing to any considerable extent from the banks. Instead they sell their securities to the public, which in buying them not infrequently borrows from the banks in order to raise part of the purchase price. Whatever we may think of the desirability of this procedure, it is one that is well established and could not be changed over night. As a consequence, no encouragement to banks by means of legal technicalities to have commercial assets is likely to succeed.

The problem of the kind of banking we want to encourage has to be met on a broader front than that, and this would lead into a subject of much wider scope than I can cover here. Suffice it to say that in the immediate future the banks must serve the needs of their communities both for long- and for short-time money. If they do not, they will not regain the field of operation which they have lost to the Government, and on the contrary will continue to lose more. This would not present a bright future for the banks.

There has been a group of critics of liberalization of eligibility who are convinced that this would encourage member banks to make unsound long-time investments and thus contribute to the development once more of a situation like the one that brought the banking system low in 1930 to 1932. This criticism also arises out of an unrealistic approach. Besides disregarding the limitations of the influence of eligibility on the behavior of banks, it is based on the opinion that the dominant reason for the wholesale bank failures of the past fifteen years was mismanagement and unsound lending and investment prac-

tices. No one would contradict that both of these evils existed, but it is my belief that better bank management must be brought about through unification of banking, through increase in the banking unit, and through better supervision and more careful control of chartering. It cannot be brought about by strict eligibility, which has not prevented disaster in the past, and presumably could not do so in the future. The increased powers given to the Board to remove officers and directors of member banks and the additional powers contained in the Banking Act of 1933 and the Securities and Exchange Act of 1934 ought to make it easier to prevent unsound practices in the banks. It is through these channels that the influence of the Federal Reserve banks towards the maintenance of sound practices in the member banks should be exerted. Strict technical definition of eligibility is neither an adequate nor an effective means of control.

One of the lessons of the experience of the Federal Reserve System is that the Reserve banks should pay less attention to the assets on which a bank borrows and more attention to the bank itself, its management, and its policies. There is greater protection for the Federal Reserve banks and for the banking system as a whole in using the System's influence through its rediscounting function towards having the banks keep their houses in order along all lines than in requiring strict adherence to legal technicalities of the paper that will be accepted for discount. The Reserve banks, as a matter of fact, have practiced that from the beginning and the System could not have functioned if they had not done so. Official and legal recognition of this practice, however, constitutes a forward step.

In an economy like ours, where nine-tenths of the money is in the form of bank deposits, bank assets back of demand deposits represent the counterpart in the banks' portfolios of the nation's current operating funds. In such an economy a drop in the national income to less than one-half of its normal level must inevitably result in the destruction of a considerable part of the value of bank assets, and since the banks' liabilities are not thereby reduced, the total value of the assets would no longer equal the total of their deposit liabilities. With full recognition of the fact that a part of our banking trouble arose from mismanagement and speculation, it is nevertheless certain that the major part of the catastrophe, particularly after 1929, was not due to mismanagement alone, and in many banks was not due to mismanagement at all, but represented the effect on the banks of a collapse in the value of national wealth and income.

Against mismanagement the fight should be along the line of more careful chartering, better supervision, and administrative correction of

unsound situations. For losses in value of bank assets arising from the collapse of national income, the remedy is the avoidance of wide fluctuations in business activity. Whether such avoidance is humanly possible or not I am not prepared to say, but that it should be the object of central bank and fiscal policy cannot be gainsaid.

I am inclined to think that an ideal system would be if neither the banks nor their depositors were allowed to suffer from losses caused by national economic collapse, because such a collapse is brought about by forces beyond the banks' control. If economic stability were achieved, there would be no bank failures from that cause. Since it is too much to hope that this can be achieved in the predictable future, other means must be relied on for protecting the banks in emergency. They are, as a matter of fact, protected to a degree by the guaranty of bank deposits and they should in addition be protected by the readiness of the central bank to liquefy sound assets when a deflation is under way and there is no market for such assets. Assurance to the bank depositors that they will suffer no loss so long as their banks are soundly managed will prevent the recurrence of withdrawals of deposits such as swept over the country in the years 1931 and 1932. There might still be losses of deposits, owing to an unfavorable balance of payments in a given region, but mass withdrawals followed by mass bank failures should not be allowed to recur.

As I have said, the guaranty of bank deposits is one safeguard, but since that is limited to deposits of $5,000, and since the worst difficulties arose from the transfer of much larger deposits, the main task of sustaining confidence and preventing mass withdrawals will continue to rest on the Federal Reserve banks.

This is not a radical doctrine. It is essentially what was done in countries that are often mentioned as examples of admirable banking practice, because they are said to protect commercial banks against unliquid assets. It is pointed out that these countries, notably England and Canada, have gone through the depression without bank failures. There is little question that at the depth of the depression the banks of Canada and of Great Britain would not have been in a position to withstand, without closing their doors, the kind of withdrawals that our banks had to meet. If that had happened, there would have been bank failures in England and Canada. The reason they did not occur was that the depositors did not withdraw their deposits, and the reason that they did not withdraw them was that they knew that the banks would not be permitted to fail. With all the banking concentrated in the hands of a small number of large banking institutions, it was general knowledge that neither the banks' competitors nor the govern-

ment would permit a bank to close its doors. Consequently, there were no wholesale withdrawals of deposits, and, as economic conditions improved, the assets of the banks rose in value, and the whole cycle was traversed without banking catastrophe.

The main purpose of this paper is to plead for recognition of the principle that so long as the assets back of the nation's current funds are not protected by the maintenance of economic stability, the banks must be carried over the abyss of economic depression by underwriting of their sound assets by the Reserve banks.

Recognition of the fact that the Federal Reserve banks may discount all satisfactory paper in case of need amounts to adoption of the principle that a central banking institution must do its share in helping the banks meet the consequences of national economic mismanagement. A full recognition of this principle and a policy consistent with it if boldly pursued should do much to prevent an extreme deflation, such as occurred in this country when the collapse of the banking system was an important contributory factor in the final phases of the deflation.

The question may be raised why it is that, if the failures were due to general economic causes and not to mismanagement, there were so many banks that have survived. Does that not mean that by prudent management any bank can be put in position to weather a storm? Far be it from me to deny that prudent management puts a bank in a better position to withstand a storm than does unwise management. But management, no matter how prudent, could not save a bank in a community whose income had been destroyed. And that is particularly true of a bank which has served the needs of its community adequately when the skies were clear. The answer is, therefore, that some of the banks that have survived are not banks at all but pawn shops or open-market investment houses. But there are others which have served their communities conscientiously and generously, and that have been managed wisely, and have survived. We congratulate them, but it is probable that their survival has been due in part to the element of luck. It may be that they happened to have customers in a line of industry that was not as hard hit by the depression as other lines, or that they had among their managers persons of independent wealth who were able to carry them over the worst period. There may be innumerable reasons for a bank's surviving, including help by the Government through the Reconstruction Finance Corporation or otherwise. There never has been a battle in which all the participants were killed, and those who have survived have not always nor necessarily been the bravest nor the strongest. They may not only be the

ones who ran away, but they may also be the ones whom the enemy fire happened to miss. The fact that many banks have survived is fortunate, but it is to be regretted that this fortunate fact should be used as an exhibit in condemning other banks which may have been managed as wisely and may have served their communities as well or better, but which were swept away by forces beyond their control.

A constructive program of banking would involve the solution of the problem of what kind of banks and banking institutions will best serve this country: whether one group or different groups; whether they shall be engaged in one line of activity only or in several lines; whether they shall be in large units or in small, and if in large, what should be the limits of expansion. These are vital problems; and perhaps the most vital one in this category is the necessity of putting all the banks under one set of rules and under one supervisory authority.

The object of my discussion has been to point out that, in addition to these structural improvements in our banking system, there is the necessity of protecting the banks in their operations under the banking system that now exists. Until we have learned to prevent economic chasms, we must be prepared to bridge them.

DEPOSIT INSURANCE AS AN INFLUENCE FOR STABILIZING THE BANKING STRUCTURE*

By Mortimer J. Fox, Jr., *Chief, Division of Research and Statistics*
Federal Deposit Insurance Corporation

Like many social reforms Federal deposit insurance was provided in a moment of great popular demand for change without much serious thought as to its effects and implications. The economists, political scientists and statisticians of the country had neglected to give much consideration to the problems of deposit insurance prior to its inauguration. For the most part during the 1920's, and even up to June 1933, these groups looked upon it as an ill conceived scheme, not worthy of their attention. Since passage of the Banking Act of 1933 and since establishment of the Federal Deposit Insurance Corporation, these groups have been inclined to accept insurance rather passively. They have not made adequate inquiry into whether or not it has a legitimate permanent rôle in the financial system. It is time that such inquiry be made. Let us first inquire into the forces which brought deposit insurance into being and then discuss its possible effects. Finally we shall consider the nature of the more important incidental rôles of the Federal Deposit Insurance Corporation, as receiver and as a supervisor of banks.

It has been a traditional function of government in this country to undertake the supervision of the business of banking in the interest of depositors and other creditors. Whether directly or indirectly, it has been the effort of governmental agencies to establish means whereby depositors in banks will be assured of the reasonable security of their funds. Federal deposit insurance is a development of this general philosophy.

Proposals and attempts to grant special protection to depositors or note holders of banks have been frequent for many decades, both in this country and abroad. Over a hundred years ago the State of New York organized a safety fund system which was designed to guarantee the circulating notes of failed banks. The National Banking Act, like the preceding free banking systems of the various states, provided a mechanism for protecting the holders of circulating notes of banks. For almost 25 years the Federal government has operated a system

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designed to give special protection to depositors who place their funds in postal savings accounts. Many European countries have systems of protecting savings deposits which are comparable. Deposit insurance has been given repeated trials on a state-wide basis. Several insurance or guarantee funds for special classes of depositors or special classes of banks are in existence today.

Countries other than the United States have also engaged in practices which are comparable to the operations of the Federal deposit insurance system and which, for the most part, have resulted from the monetary and financial uncertainties following the World War. In their simplest form they consist of a state guarantee of deposits in certain banks. Such practices are consistent with the general assumption in European countries that large banks will not be permitted to fail at the expense of depositors.

In this country since 1864 and prior to the introduction of the Banking Act of 1933 over a hundred bills were introduced in the two houses of Congress which in some form or other called for Federal insurance or guarantee of deposits. These bills represented demands which received considerable support, particularly in the agricultural districts. However, it was not until the full effects of the industrial depression which followed the stock market collapse of 1929 had been felt that a really impressive demand for Federal insurance or guarantee of bank deposits appeared.

POLITICAL SUPPORT

The political support which made possible creation of the F.D.I.C. rested upon several bases. Since the banking system had collapsed, Congress considered it essential to take some action which would present to the public a tangible and fundamental change. Deposit insurance appealed to the legislators as fulfilling this need. It was believed that confidence in banks had been so shattered that as a prerequisite to general economic revival the public must be assured that in the future their funds would be safeguarded. It may be that general confidence was sufficiently established after March 1933 and that it was unnecessary, therefore, to create Federal deposit insurance, which was not to become effective until nine months later. But there can be no doubt that the desire to establish and maintain confidence was one of the principal reasons for the political support which deposit insurance received.

That support also rested upon a general desire to increase security and to reduce the economic uncertainties to which the vast majority of the population had been subjected. As an expression of this philos-

ophy Federal deposit insurance is a part of the trend toward social security legislation and toward the creation of agencies designed to establish some degree of stability in agriculture and industry. Finally, the support which made possible the passage of that part of the Banking Act of 1933 which created the F.D.I.C. represented a combination of those who wished to establish an organization for liquidating banks and for making immediate advances to depositors in banks which had already failed and those who wished to insure or guarantee depositors against loss in the future.

THE CORPORATION AS AN INSURER

Partly as a result of the political compromise which was reached when the Corporation was established and partly as a result of a certain vagueness of thought as to what might be accomplished by this agency, the F.D.I.C. as now constituted performs at least three distinct functions. First, the Corporation acts as an insurer or guarantor of bank deposits up to a maximum of $5,000 per depositor in any one bank. Second, it may act and in some cases does act as receiver for insured banks which fail. And, third, it exercises supervision over insured State banks which are not members of the Federal Reserve System.

In its primary rôle as insurer the Corporation provides the vast majority of depositors in banks of the United States a degree of security which is socially desirable. Small capitalists are no longer subjected to involuntary sacrifices. Federal deposit insurance will in a large measure eliminate the unjustified losses to depositors which, for the 70 years 1865–1934, aggregated approximately $3,500,000,000.

This very security has been the cause for some of the strongest criticism. It is popularly maintained that when depositors no longer have motives for choosing good banks as opposed to bad ones, there has been injected into the system an element of weakness. Without the incentive to satisfy the demands of depositors, bank management may be inclined to engage in unsound and speculative practices. It is said with uniform security extended to the vast majority of depositors there will be little reason for depositors to choose soundly managed rather than poorly managed institutions. In short, it has been said that insurance will operate to penalize the good banks by placing the poorly managed banks on an equal competitive basis.

These criticisms appear to be superficial for the following reasons. In the first place, information which is available to depositors does not show the true condition of banks. No supervisory authority has had as yet the legal power to require publication of statements which would

reveal the true net condition of a bank. But even were this information available, it is questionable whether depositors have either the inclination or capacity to discriminate between the well-managed and the poorly-managed institution, or, for that matter, to produce any significant influence on bank management. It is probably true that some risk-bearing is desirable from a social standpoint, in that it forces risk-bearers to make decisions. If the economic processes are to be successfully prosecuted, these decisions must be made. But the removal of the risk from the shoulders of small depositors who can ill afford the consequences of unintelligent decisions does not jeopardize the proper functioning of the economic system. In the second place, insofar as deposit coverage is limited, depositors who are not fully protected by insurance still continue to exercise as much influence over banking standards as has ever been the case. In the third place, it seems unreasonable to assume that, merely because of the advent of deposit insurance, bank stockholders no longer have an interest in the security of their investments. Deposit insurance has not significantly altered the influence of stockholders upon management.

Deposit insurance may reduce the severity of depressions. In the past the general public repeatedly lost confidence in banks, and runs upon them were frequent. As the public's fear for the security of their funds increased, banks found it necessary to place themselves in a more and more liquid position. In the attempt to shift and liquidate assets, markets became more and more depressed and the financial difficulties of the borrowers of banks increased. As a result, general business conditions became less satisfactory and the banks found themselves in a serious condition. Bank runs therefore have increased the cumulative forces of depression. Since the bulk of depositors are now secured by the F.D.I.C., the incentive for bank runs in all probability has been reduced. If the F.D.I.C. is successful in making bank runs a thing of the past, then it will be a factor in retarding the vicious circle of deflation.

It is well to consider, however, whether the destruction is caused by the withdrawal of a large number of small balances or whether it is caused by the "galloping" of the large deposits, not only from one bank to another but from one area of the country to another. The silent runs caused by withdrawals of accounts with balances of over $5,000 may be a more frequent cause of the failure of an institution than the run which is brought about by the withdrawal of the small accounts of a large number of depositors. Then again with limited insurance large depositors may no longer have the incentive to protect local institutions for the benefit of creditors and borrowers alike.

The most important part of our circulating medium today is bank

deposits subject to check. Destruction of a part of this circulating medium contributes materially to the continuation and deepening of depressions. Circulating medium is destroyed through the call of loans and the sale of securities. Insofar as the activities of the Corporation will lessen the cause for dumping securities and collecting loans, they will have a tendency to reduce destruction of the circulating medium.

The depressing effect of bank failures upon individual communities is reduced through the operation of deposit insurance. Heretofore, the economic life of a community has been practically paralyzed by a bank failure which tied up its liquid funds. Today, when an insured bank fails, depositors in the institution receive their funds immediately from the reserves of the Corporation. Losses to depositors are no longer borne entirely by the local community. Receivers of failed insured banks find that liquidations of these institutions proceed more rapidly than they expected from their past experiences in this kind of work. They ascribe this improvement to the speedy payment of depositors by the insurance corporation.

The issues involved in the extent of insurance coverage have not been fully considered. The amount of coverage in itself is a debatable issue. Certainly there was no scientific basis for the selection of the present limit. It was agreed in general that the liability of the Corporation should be restricted but that the vast bulk of the depositors should be protected in full. It was believed that this would materially reduce the cost of insurance without substantially limiting its benefits. Under the provisions of the original Temporary Fund, insurance protection was provided up to $2,500 per depositor. Statistics gathered at that time showed that probably 97 per cent of all the depositors were fully protected. Nevertheless, Congress deemed it expedient to raise the coverage to $5,000.

While under the present limit by far the greater proportion of depositors are fully protected, the Corporation is probably not liable for more than 45 per cent of the total deposits of insured banks. As we have already noted, if the Corporation is to maintain confidence during times of depression and thus remove the necessity for cumulative liquidation, it may be necessary that large as well as small depositors be protected. Analyses made recently seem to indicate that since the failing banks are usually small and since almost all the deposits in these institutions are fully covered by insurance, the cost would not be materially increased if coverage were extended beyond the present limit. From a practical standpoint, however, it does not seem wise to extend the limits at this time for the following reasons: First, it cannot be assumed that only the small banks will continue to fail. Second, the

psychological effect of subjecting the Corporation to a risk which is over twice as great as that now assumed, without increasing its revenue or its reserves, may be undesirable. Third, deposit insurance on a nation-wide scale is an innovation and as yet experience in its administration is limited.

Up to this point we have referred to the business of the Corporation as deposit insurance. Let us consider briefly the nature of the risk which the Corporation assumes. Are these risks insurable? Can the protection which the Corporation offers to depositors be considered insurance? Can it be placed on an actuarial basis?

In the first place, the bulk of bank failures have occurred at unpredictable intervals. The "catastrophe hazard" in the case of bank deposits is so great as practically to preclude the possibility of genuine insurance. In the second place, because banking is peculiarly affected by economic and legislative developments, in a multitude of fields, it is unreasonable to suppose that the experience of the past gives any indication of what the losses to depositors may be in the future. In the third place, because the Corporation assumes risks which are concentrated in a comparatively small number of large units, and because frequently the failure of a large bank causes the failure of many small correspondent institutions, the distribution of its risk is not comparable to that of other types of insurance. In the fourth place, because the Corporation's source of revenue is in the nature of a tax, levied uniformly upon banks on the basis of total deposits, the so-called "premiums" bear little relation to the degree of risk assumed or the value of the insurance protection offered. In the fifth place, the Corporation has available to it the credit of the Government, without which deposit insurance would probably not be possible.

THE CORPORATION AS RECEIVER

The second basic function of the Corporation is its power or duty to act as receiver for insured banks which fail. For those national banks which are closed because of insolvency, by action of either the Comptroller of the Currency or local directors, the Corporation is appointed receiver. In some states the laws permit or require the appointment of the Corporation as receiver for insolvent State banks and the Corporation is authorized to act in this capacity when so appointed. In exercising this function the Corporation acts as an agency for salvaging assets in the institutions in which it has assumed and discharged its liability.

From the point of view of the Corporation it is important that it have considerable influence and supervision over the liquidation of the

assets of failed insured banks. In most cases, either the failing banks are small or the uninsured deposits have been withdrawn before the banks close with the result that the insured liability amounts to 80 or 90 per cent of the total deposits at the time of failure. The Corporation, therefore, becomes subrogated to 80 or 90 per cent of the depositors' claims, thus becoming by far the largest single creditor. Some practical problems in connection with the supervision or liquidation of such assets have developed. When the Corporation is not appointed receiver there is a possibility that the liquidation will be detrimental to the interests of the Corporation. A receiver appointed by the State authorities whose actions are reviewed by a local court presumably would have a tendency to favor the local debtor rather than a foreign creditor, particularly when that creditor is a large Federal corporation. On the other hand, where the Corporation is appointed receiver it becomes exceedingly difficult to manage the affairs in a manner satisfactory to the local supervisory authority—to avoid arousing antagonism on at least some of the multitude of details which must be worked out.

In the past, receivers have been under pressure from depositors to liquidate as rapidly as possible, no matter what the condition of the market for the assets might be. In many instances this necessitated substantial sacrifices on the part of depositors and had the tendency to add further deflationary forces to markets which were already depressed. Liquidation of certain assets may be postponed under the present system to the benefit of both the Corporation and general economic conditions. The Corporation can refrain from throwing on local and national markets those assets whose value would be maintained if for a time kept off the market. Such measures serve as a stabilizing influence. The potentialities which exist in a centralized and national agency designed to handle receiverships are worthy of further consideration, particularly as media for lessening the depth of depressions.

THE CORPORATION AS SUPERVISOR

The third basic function performed by the Corporation, and the one which actually occupies most of its personnel, is that of supervision of State banks which are not members of the Federal Reserve System. In fact, the bulk of the immediate problems with which the Corporation is faced has to do with bank supervision.

It is a postulate of American banking, conducted as it is under the unit system, that there be a substantial degree of governmental supervision over the operation of the individual units. Supervision of the

banking business seems particularly necessary since liabilities of banks constitute the major portion of the circulating medium and since it is difficult for depositors to determine the soundness of the depository institutions. There was danger that with the inauguration of insurance, supervisory standards of existing authorities would suffer, since in a large measure the responsibility to depositors has been shifted from these other authorities to the Corporation. Consequently it was deemed necessary that the F.D.I.C. itself set up a supervisory organization in order to guard against the lowering of supervisory standards and in order to reinforce and raise the existing standards. Since the Corporation has a direct financial obligation to depositors, it has a greater incentive for effective bank supervision than has existed heretofore in any governmental authority.

The Corporation's chief interest in supervisory powers is as a means of limiting the loss which it will be obliged to assume. For the time being, there are three fundamental methods through which the Corporation attempts to accomplish this purpose.

In the first place, the Corporation recognizes that a substantial local equity of net sound capital is perhaps the best way to reduce losses to depositors and consequently to the Corporation. The greater the capital cushion, the greater will be the protection to depositors and hence to the Corporation. For the past 70-year period, this capital cushion has been subject to a steady decline. The Federal supervisory agencies have been using tentatively as a rule of thumb a minimum ratio of capital to deposits of one to ten. Whether this ratio is adequate and whether it may be applied uniformly to banks in all geographic locations and of all sizes requires further study. There is reason to believe that a much higher minimum standard needs gradually to be set up. The tangible ways in which the Corporation has attempted to assure the adequacy of the capital structure of insured banks is as follows: Banks which become newly insured have been required to show this minimum capital ratio. Banks wishing to reduce their capital structures have been required to receive the Corporation's permission before taking action. Considerable pressure has been exerted by the Corporation to build up the capital structures of banks.

In the second place, the Corporation has been charged by Congress with the broad duty to take steps toward the ejection of a bank from insurance whenever it shall be found "that an insured bank or its directors or trustees have continued unsafe or unsound practices." To date the Corporation has limited its efforts in discharging this responsibility solely to State banks not members of the Federal Reserve System. Through the medium of direct examination the Corporation

undertakes to ascertain the adequacy of the banks' management, the extent to which the operations of the bank are within the law, and other factors which determine the Corporation's risk.

In the third place, the Corporation has been given considerable authority in connection with admission of banks to insurance. Congress has set definite standards by which the Corporation shall judge whether or not to admit a bank. The practical problems which are involved in formulating a policy for placing these standards in operation are many. The attempt to determine, for example, whether or not a small bank in a town of less than 500 population located perhaps 10 or 15 miles from an existing insured bank with a capital structure of 15 or 20 thousand dollars should be admitted to insurance presents problems of far reaching implications.

The means by which the Corporation will be effective in exercising supervisory influences are two-fold. In the first place, the Corporation actually has considerable power as a result of moral suasion. Banks are, on the whole, coöperative and their officers frequently see the practical aspects of the suggestions made by the Corporation and consequently put them into effect. In the second place, Congress has given the Corporation the authority, after due notice has been served upon the bank and upon supervisory authority, to expel from insurance benefits a recalcitrant institution. The threat of expulsion has been the most potent means at the disposal of the Corporation for enforcing its recommendations. The efficacy of expulsion as a means for enforcing standards set by the Corporation depends upon the importance which depositors attach to insurance. If a bank can live just as successfully without insurance, such means of influencing banking standards become valueless.

Finally there may be some basis for the contention that the agency which undertakes to guarantee deposits should not also supervise the insured banks. There may be danger that the Corporation will act too much with a view to its own pecuniary interests and not with a view to the general benefit of the economic system. There may be danger that the Corporation will exert its influence to keep insured banks from being declared insolvent in order that it may show a favorable financial record. The control which the Corporation can exercise may actually be no better than that which has been exercised by existing State and Federal supervisory authorities.

CONCLUSION

In conclusion we have seen that prior to the banking holiday bank supervision proved to be incapable of maintaining the security of de-

positors' funds. The F.D.I.C. was established to serve purposes for which supervision alone had proved inadequate.

There are three basic functions of the F.D.I.C.: first to act as insurer of deposits up to a maximum of $5,000 per depositor and to spread the losses resulting from bank failures to the entire banking system and the taxpayers and away from the local community; second, to act as a salvaging agency in an attempt to get the maximum recovery out of assets in banks which fail and at the same time to cause the least damage and hardship to the economic structure; third, to act as a supervisory body in an effort to raise the standards of existing supervision and to avoid any relaxing of those standards.

In my opinion the F.D.I.C. offers potentialities which when developed may serve effectively to lessen the cumulative forces of depression.

THE EVALUATION OF THE EFFECT UPON MORTALITY STATISTICS OF THE SELECTION OF THE PRIMARY CAUSE OF DEATH*

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For almost a century the nations of the civilized world have been working to develop a uniform reporting system for causes of death. As late as 1893, no two countries had attained complete uniformity of technique in their methods of statistical classification of causes of death. Since that time, the International List of Causes of Death has been established and adopted in most of these countries. More than one-half of the death certificates in the United States have on them two or more titles for cause of death. The tabulation of the multiple causes of death involving such a high proportion of the death certificates constitutes a major technical problem. Consequently, methods of procedures supplementary to the International List have been developed by this country to aid in the selection and tabulation of the primary or principal cause of death.

At the 1929 meeting in Paris of the International Commission charged with the decennial revision of the International List of Causes of Death, it was recommended that the United States Government, which had developed rules for codification and selection of such primary causes of death, be asked to take measures for the establishment of a code of general instruction which could be adopted by the countries using the International Nomenclature. Thus this country was given the opportunity to assume the leadership in this particular problem.

The problems involved with the selection of the primary cause of death are peculiarly complex and bewildering in character. The rules themselves, as expressed in the Manual of the Joint Causes of Death, have resulted from certain general concepts. These concepts in turn have arisen from the principles of nomenclature. Since there is no sharp line of demarcation between the problems involved with the selection of the primary cause of death and those inherent in the nomenclature of causes of death, the principles of nomenclature must be reviewed in a study of this subject.

Cause of death nosology is the basis of mortality statistics. Mortality nosology consists of four major divisions: definition of the disease

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entities; nomenclature of diseases or the assignment of appropriate names which are acceptable; classification of terminology in some methodical or convenient order; and adaptation of an appropriate coding system for the disease classification which will best serve the statistical function in the tabulation of data collected from the death certificates. The definition of a disease entity is the first function of medical nosology. At present the medical dictionary offers the only means to meet this need. In a subject advancing and changing with the rapidity of medicine, it is difficult to keep definitions abreast of new usage and significance. Not only is clinical terminology constantly expanding in the use of new terms but old words take on new senses, while others descend into disuse.

The selection of the best name for a given disease entity is the function usually ascribed to medical nomenclature. Differences of opinion exist as to the proper basis for selection of the best name. In view of the confusion existing in nomenclature and the passion for invention of new terminology, it seems advisable to effect, if possible, a systematic clearance of new names through some recognized central agency.

Classification of disease has been and continues to be a battle ground for the conflicting interests and desires of various medical groups. A great many classifications of disease entities have been used by the medical profession in the course of the last hundred years. Each has arisen from the desire to arrange the nomenclature in the most natural order possible for convenience and facility of usage. The selection of any one plan to the exclusion of all others must of necessity be artificial since it is arranged to elucidate or support a given theory or to attain a definite end. The progress of medicine will be advanced by establishing useful, broad classifications if the classification scheme itself is not allowed to throttle new attempts at reclassification and study. This end can be attained through a coding system built around groups of related terms. A satisfactory coding system must give full recognition to the following principles: it should permit a minimum of variation in judgment to the clerk assigning the code number to a given medical term; it should eliminate differences in coding to a degree of fineness the differentiation of which would lead to a conflict of opinion between physicians; it should be constructed around numbers grouping broad categories suitable for tabulation and comparison of mortality statistics; it should be adapted to the use of punched card and mechanical tabulation; and finally, it should permit almost unlimited expansion for new terms without the destruction or replacement of code numbers already existing for terms in active use.

To a certain degree the International List of Causes of Death is

involved with each of the four divisions of nosology: definition, selection of best name, classification, and coding. In the early consideration of the principles underlying the International List of Causes of Death, the alleged primary purpose of the Manual was to create a systematic plan for the issuance of reports on death, and a code by which comparability of international reporting might be maintained. Consequently, very little effort was expended in considering the definition of terminology, and practically no effort was made to obtain a proper nomenclature of disease from the standpoint of selecting the best name for any one disease entity. The proposal of the "Committee on the Accuracy of Certified Causes of Death," which was submitted to the Vital Statistics Section of the American Public Health Association in October of this year, recommended the adoption of preferred terms in the tabular portion of the International List. If this recommendation is accepted it is anticipated that these preferred terms will be printed in bold-faced type in the next edition of the Manual of the International List of Causes of Death, both in the tabular and in the index portions of the volume. The only other attempt to select most appropriate names for causes of death has been the establishment of a list of undesirable terms and an attempt to eliminate the common usage of such terms by reporting physicians.

No claim was made that the classification of the International List was to be considered a scientific classification of disease. Obviously some condensation of the thousands of medical terms was necessary in order to facilitate the compilation of the statistics of death. Such a list might be arranged or classified in any order. The order finally adopted in the List has the advantage of grouping together many causes which are frequently studied together. It is a practical working code whereby the statistician can assign medical terms reported by physicians as causes of death to more or less definite titles, representing, from the statistical standpoint, relatively homogeneous groups of diseases.

The International List and its usefulness must be judged primarily in the light of how well it serves its alleged primary purpose. Only in so far as it has established a high degree of comparability in death statistics will it have served this end. An excellent historical view of the development of medical nosology and the International List is contained in the Introduction of the 2nd edition of the Manual of the International List of Causes of Death. From among many systems of nosology, William Farr selected that proposed by Cullen and modified it for statistical purposes. This statistical modification was the framework for the first International List. The List was adopted for the first

time in Paris, in 1855, and has undergone successive decennial revisions since that time.

Comparability of the death reports from various nations has improved with each successive revision of the International List. Nevertheless, important differences in the statistics between countries have been present. Some of these differences arose from inadequacy of definitions and some from variations in assignment of colloquial terms in the index of the lists of various countries. In part, divergence has been due to the variation in the classification of Joint Causes of Death. Difficulties of tabulation make it advisable that only one cause be tabulated for any particular death. It is common practice for the physician to note two or more causes of death for a given case. These causes may be either related to each other or totally unrelated. According to the present practice only one of these causes can be recorded as the primary cause of death. In 1917, 35 per cent of the death certificates in the United States had two or more causes of death reported. In 1925, this percentage was increased to 45. In 1934, 69 per cent of the certificates in New York State were in this class. In those areas where the medical profession seems to be most progressive, the percentage of the number of multiple deaths is usually higher and the problem of obtaining a uniform method of selecting the primary cause of death is more acute. Without a solution of this problem international comparability of statistical reporting can never be achieved.

In the first Manual of International Classification of Causes of Death, 1902, five general rules of guidance were formulated, designed to assist the coder of cause of death in making decisions concerned with the selection of the primary cause of death.

These rules were:

> Rule 1. If one of the two diseases is an *immediate and frequent complication* of the other, the death should be classified under the head of the primary disease.
>
> Rule 2. If it is not absolutely certain that one of the diseases is an immediate result of the other, we must see if there is a very great difference in the gravity of the two, and classify the death under the head of the more dangerous.
>
> Rule 3. When among the two causes of death there is a transmissible disease, it is preferable to assign the death to it, for statistics of infectious diseases are particularly interesting to the sanitarian, and it is important that they shall be as complete as possible.
>
> Rule 4. If a disease whose evolution is rapid is given in connection with another whose evolution is slow, it is preferable to charge the death to the first.
>
> Rule 5. Finally, if none of the preceding rules is applicable, the diagnosis most characteristic of the case should be selected.

In 1909, the International Commission did not give especial consideration to the problem of Joint Causes, but at the insistence of

Dr. Bertillon it agreed that the above rules should be continued, and a special committee was appointed to report on the subject. Wide variations in the instructions employed in various offices made it apparent that a considerable factor of uncertainty existed in the statistical results when a large proportion of joint causes was involved. General rules such as the above could not insure identical compilations from the same material. Methods in the same office varied from year to year and the coders of the death certificates found it necessary to vary their judgments to meet this changing coding method.

In order to meet these needs, the Manual for Joint Causes of Death was developed by the United States. To date there have been three editions of this Manual. The first edition was in 1914. The original Manual was printed as proof, and the criticism of statistical workers was invited. The second edition, published in 1925, followed an ingenious plan proposed by Dr. Bertillon. In place of a cumbersome index, a definite list of decisions was given for any two titles or subtitles of the International List. The third edition of the Manual of Joint Causes of Death, an extension of this process, was published in 1933.

It is well to note at this point that there is no sharp line of demarcation between the decisions concerning priority of multiple causes of death by the Joint Cause Manual and the multiple causes listed arbitrarily under a single International List number in the index of the International List. For example, diabetes is coded as 59; gangrene as 98; and diabetic gangrene as 59. Such a combination cannot be separated from the diabetic group nor counted as a part of the cases of gangrene, yet the risk of death of diabetic gangrene probably differs from the risk in uncomplicated cases of either diabetes or gangrene. Hundreds of such combinations are printed in the index of the International List. Each combination represents a decision of the same general type as decisions which are made in conjunction with the use of the Manual of the Joint Causes of Death. The more or less arbitrary rules for selection stated in this Joint Cause Manual represent a direct extension of the relatively inflexible decisions concerning combination terms which already exist in the index of the International List. Since each foreign country constructs the index of the International List to suit its own purposes, such combinations in the index may be assigned to different code numbers by the various countries or may be considered as two separate terms and treated like multiple causes of death; that is, there may be entire lack of uniformity in the handling.

The United States from the beginning has taken a stand on the

policy of creating arbitrary rules for the selection of the primary cause of death as expressed in the Manual of Joint Causes of Death. It has tempered these arbitrary rules by building up a list of exceptions whenever the rules seem inconsistent either with the selection of the disease leading to the eventual cause of death or, if this cannot be determined, with the selection of the term which represents the greatest risk of death.

The opinion of the Registrar-General of England, which is concurred in by registrars in a number of other foreign countries, is that more reliance should be placed on the opinion of the certifying medical practitioner with the hope of eventually dispensing altogether with the arbitrary rules of priority.

The general discussion concerning the selection of primary cause of death is not complete without a statement concerning the attitude and work of Dr. Julius J. Pikler, Vice-Director of the Budapest Communal Statistical Bureau. In 1909 Dr. Pikler published his results on "The Budapest System of Statistics on the Causes of Death." He proposes an extension of the Budapest system which

> . . . makes accessible the complete number of all causes of death occurring in the course of the year, whether independently or in combination, and on the other hand it furnishes a complete summary and a check upon the editing and arranging of the data and the choice which has been decided upon in the case of double or triple causes of death.

After a description of the technical tabulation methods involved in his plan, Dr. Pikler concludes with the statement that

> The system is capable of complete accuracy since the data are subjected to thorough and expert examination and compilation; it shows all causes of death without exception, occurring in the course of the period under observation, and of course gives the full number of each one of them, thus including those diseases considered by the compiler (more or less incorrectly) as mere complications; it brings clearly in view the choice which the compiler has made in each individual case of joint causes of death, and hence makes possible a criticism of this choice, and enables one to judge the comparability of the statistics with earlier reports of the same bureau and with reports on the causes of death from other statistical sources.

The United States Division of Vital Statistics has published contributory tables of the multiple causes of death for the mortality statistics of 1917 and 1925. These tables deal only with the primary and first contributory causes of death and omit any information which might have been given on more than the first contributory cause. The first contributory cause was selected by the same rules established in the Joint Cause Manual which were used to determine the primary cause of death. In both instances the entire registration area was reported. These tabulations prove conclusively that no matter how the primary cause of death is selected, important data will be omitted

unless the contributory causes themselves are tabulated. The percentage completeness in the reporting of any cause of death as a primary cause is listed below for some of the more important diseases.

Cause of Death	Per cent of deaths coded as primary cause of death		Shift in per cent
	1917	1925	
Other diseases of heart	76.4	70.3	− 6.1
Other diseases of arteries	32.1	24.4	− 7.7
Senility	36.5	27.8	− 8.7
Bronchopneumonia	64.2	56.6	− 7.6
Chronic nephritis (incl. unspecified 10 yrs. and over)	76.3	80.0	+ 3.7
Cerebral hemorrhage	88.7	81.1	− 7.6
Congestion and hemorrhagic infarct of the lung	10.0	8.1	− 1.9
Peritonitis without specified cause	13.0	10.1	− 2.9
Cancer	99.8	99.8	0.0
Endocarditis and myocarditis	39.1	39.0	− 0.1
Lobar pneumonia	92.3	84.8	− 7.5
Paralysis without specified cause	42.3	40.6	− 1.7
Purulent infection, septicemia	14.9	12.2	− 2.7
Pneumonia (unspecified)	55.3	38.3	−17.0
Acute nephritis	49.6	43.0	− 6.6
Tuberculosis	99.2	98.8	− 0.4
Other diseases of the stomach (except cancer)	48.5	45.2	− 3.3
Congenital debility, icterus, sclerema	83.3	53.0	−30.3
Influenza (other and unspecified)	66.8	76.3	+ 9.5
Simple meningitis	30.4	29.6	− 0.8
Intestinal obstruction	63.3	56.7	− 6.6
Other diseases of the liver	53.2	46.6	− 6.6
Asthma	31.7	26.8	− 4.9
Other forms of mental alienation	29.8	24.5	− 5.3
Embolism and thrombosis (not cerebral)	39.0	28.7	−10.3
Infantile convulsions (under 5 yrs.)	26.4	26.9	+ 0.5
Anemia, chlorosis	59.5	57.3	− 2.2
Diarrhea and enteritis (2 yrs. and over)	69.5	62.8	− 6.7
Pleurisy	41.5	36.0	− 5.5
Gangrene	30.1	22.3	− 7.8

For instance, there were 58,979 death certificates in 1917 which contained bronchopneumonia as a cause of death. In only 37,879, or 64.2 per cent, was bronchopneumonia recorded as the primary cause.

From these data it is obvious that a knowledge of death rates derived solely from the primary cause of death cannot be complete. Although in some diseases such as cancer or tuberculosis it will be much more complete than in other diseases such as asthma and pleurisy. Moreover it is also evident that the relative number of certain causes of death coded as primary such as cancer and meningitis have remained about the same between the years 1917 and 1925, while other causes such as pneumonia and influenza have shifted sufficiently to destroy in part the comparability of time series comparisons.

Since the alleged purpose of the International List of Causes of Death and the Manual of Joint Causes of Death is to create a mechanism by which comparability of mortality tabulations may be maintained, this subject will now be summarized. A certain amount of incomparability of the description of cause of death has resulted and probably always will persist due to changing medical practice. As pointed out previously in this paper, the use of medical terminology is in constant flux. Variations exist in definitions and choice of nomenclature between physicians in different nations, different communities

and, to some degree, even in the same community. The science of medicine is ever changing, which means that new terms will be coined and new connotations of old terms will creep into usage with the passage of years. Habits and attitudes of the profession toward noting the true cause of death are yet other factors to be reckoned. For the most part these are a direct result of the physician's desire to protect the interests of his patient. It is difficult to evaluate the constantly shifting influence of changing medical practices on the comparability of cause of death statistics.

Comparability has been materially affected by variations in coding practices in the various offices of vital statistics. Many special decisions concerning the coding of mortality have been made during the past decade in the United States Division of Vital Statistics of the Bureau of the Census, as well as by various State Divisions. These decisions have involved the coding of causes of death by use of the International List and the establishment of the primary cause of death by use of the Manual of Joint Causes of Death. Variations between the coding carried out by State offices and the Federal Division of Vital Statistics on identical certificates varies as little as one-half of one per cent to as much as 20 per cent of the coded titles. The usual discrepancy would amount to about 10 per cent in the coding of all causes of death.

Dr. Murphy attempted to ascertain the amount of variation between the statistical offices of different nations. On July 8, 1935, he sent a list of causes of death taken from 1032 death transcripts to 46 nations. Each item on this list was involved with two or more causes of death. To date ten nations have answered his request and eight nations have indicated the code number which would represent their selection as primary cause.

Ceylon proves to be the nation coding most nearly like the United States, having 88 per cent of the primary cause selected as those coded according to United States rules of practice. The coding of these nations coincides with that of the United States in the following proportions: Ceylon, 88 per cent; Philippine Islands, 83; Canada, 61; Denmark, 58; Holland, 56; England and Wales, 53; Spain, 43; and Belgium, 43. Of the titles coded according to the United States practice, 11 per cent were so coded by eight nations, 40 per cent by six or more nations, 73 per cent by four or more nations, and 99 per cent by at least one nation among the eight.

Even more important than the necessity for obtaining comparability of statistics between nations is the urgent necessity of arriving at comparability from the standpoint of time trends in such data. The United States death rates from 1900 to date are broken in many

places by unexplained decisions. It is probably true that most of these decisions have resulted in cause of death codes which are more consistent with current scientific medical practice, yet each change has meant, to a greater or lesser degree, a loss of comparability with past time trends. As an example of the effect of such arbitrary decisions, the death rates per 100,000 between the years 1900 and 1910, for the titles "Lack of care" and "Congenital debility," are reproduced below:

Year	Lack of care (death rate per 100,000)	Congenital debility (death rate per 100,000)	Total for both titles (death rate per 100,000)
1900	16.3	24.5	40.8
1901	15.1	20.9	36.0
1902	15.7	21.6	37.3
1903	13.7	21.2	34.9
1904	14.4	20.6	35.0
1905	3.0	31.2	34.2
1906	.9	33.4	34.3
1907	.3	32.8	33.1
1908	.3	30.9	31.2
1909	.2	26.5	26.7

It is obvious in this particular instance that a decision was made involving the transfer of most of the deaths due to lack of care to the title of congenital debility.

Another example of the influence exercised by a contributory cause of death upon the significance of death rates computed on the primary cause, is seen in the reports following the "flu" epidemic of 1918. This epidemic resulted in excess mortality rates not only for influenza but for a number of other diseases. Interpretations of such death rates necessarily should involve a consideration of the occurrence and influence of influenza as a contributory cause to other causes of death which were tabulated as primary.

With each decennial revision of the International List many titles are shifted from one number in the tabular list to another number. In the fourth edition of this volume, twenty-eight pages of text are assigned to the enumeration of the changes in the detailed International List. It is true that many of these changes are trivial in character involving titles which are relatively infrequent. At times, however, the decisions have involved hundreds of cases which cannot be recompiled in any way even in coarser categories in order to compare statistics prior to 1929 with those of 1930 and later. An example of this type is the changes involved with coronary disease, embolism, and thrombosis. In 1929, titles 91b and 91c contained 23,407 deaths due to arteriosclerosis, and coronary disease, and title 92 contains 6,448 deaths due to embolism and thrombosis. It is impossible to compare accurately these data with 1930 statistics which group 9,438 deaths

due to coronary disease under title 94b, 21,868 deaths of arteriosclerosis under title 97, and split the deaths due to thrombosis and embolism between titles 99, 100, and 103.

In an attempt to create greater comparability of mortality statistics, both from the standpoint of geographical and time trend differences, supplementary instructions to coders of causes of death have been prepared in the Division of Vital Statistics of the Census Bureau. Effective with the release of these instructions early in January 1936, the rules stated will be adhered to strictly by the Division of Vital Statistics and no alterations will be made except by officially approved amendments. A preliminary draft of these rules has been submitted for criticism to many people in the last two months. They were approved on November 29 by a Subcommittee appointed at the direction of the Special Advisory Committee of the Division of Vital Statistics. Dr. Haven Emerson was Chairman of this Subcommittee. The other members invited to attend the November 29 meeting were: Mr. George H. Van Buren, Mr. John O. Spain, Mr. Thomas J. Duffield, and Dr. W. Thurber Fales.

It is recognized that occasionally this policy will result in misallocation of a particular primary cause of death. However, consistency in coding can be maintained only by following such a plan. The true significance of the primary cause of death which has been selected under the Joint Cause Manual and the rules contained herein, can be determined and measured only by actually tabulating all causes of death in a sufficiently large sample to measure the effect of the Manual of Joint Causes of Death on death rates which have been established on primary causes of death selected under that Manual.

Under the plan of coding for mortality statistics inaugurated by this Division for use during the year 1935, the number of causes of death are to be counted for each certificate filed, and this total is to be punched on the tabulating card in addition to the punching for the primary cause of death. Because of the widespread interest in maternal deaths, all causes, both primary and contributory, for maternal causes of deaths, Numbers 140–150, are to be counted, coded, and tabulated. This will be done for the entire registration area. Further, for the State of Maryland, all causes, both primary and contributory, are to be counted, coded, and tabulated.

It is hoped that the effect of the Manual of Joint Causes of Death on death rates which are established upon primary causes of death may be measured and interpreted on 1935 mortality statistics by an analysis of the following tabulations:

1. Primary Causes of Death as Determined by the Manual of Joint

Causes of Death. This is the customary tabulation presented in Tables 6 and 8 of the annual Mortality Statistics.

2. Enumeration of the Number of Multiple Causes of Death with Each Primary Cause of Death. This count of multiple causes will be carried as a nine-column tabulation after each primary cause of death and will serve to indicate the complexity in selection of the primary cause of death.

3. Multiple Causes of Death for All Maternal Deaths (International List Numbers 140–150) whether such deaths are primary or contributory. This tabulation is of particular interest to a large group of persons. It will serve as a mechanism to permit comparison of differences between the various States in their habits of reporting multiple causes.

4. Enumeration of all Multiple Causes of Death with each Primary Cause of Death in the State of Maryland. Maryland was selected because it has a small total number of certificates, because it involves a good division between city and rural and between white and colored, and because the standards are high from both the medical and vital statistics viewpoints. This tabulation will serve as a sample in which the multiple causes of death for each primary cause of death can be studied. Results in Maryland, together with the results of tabulations 1, 2, and 3, can be used to develop a correction factor for the interpretation of death rates in other States which are based solely upon the primary cause of death.

NOTES

THE PRESENT INTERESTS OF PHYSICISTS IN STATISTICS

In the preceding century it was not unusual to find physicists and astronomers contributing to statistical theory. As a matter of fact, the main exponents of applied probability were leaders in these fields. The names of Gauss, Bessel, Encke, Helmert, Maxwell, and Boltzmann are famous not only in physics and astronomy but also in the developments of the adjustment of observations and statistical mechanics. But if statistical theory was for a time the adopted child of physicists, it acquired means of locomotion and set up a separate household some years ago—not with hard feelings; on the contrary, with frequent exchanges of mutual benefit, powerful examples being the contributions of Ehrenfest (1880–1933) and of the astronomer Charlier (1862–1934).

As a result of this partial separation physicists as a rule can justly be accused today of using antiquated statistical methods. This might be considered natural; time is required for the dissemination of accomplishments on the frontiers of any subject. Many of the newer results in mathematical statistics have not yet been translated into the form and language of physics. Curve fitting, for instance, to a biometrician means the graduation of a frequency distribution; to a physicist it means the accommodation of a function to observed points in the xy plane. There is a good deal of ground common to the two problems, but the connections need to be illuminated. It is a pleasure to report that progress along this line is being made, and it seems likely that exchanges will soon take place to the benefit of statistics as well as physics.

In the past, courses in physical measurements have, as a rule, gone so far as to take up the matter of accidental errors and even to teach a little about probable error; sometimes a little curve fitting. It is of course highly desirable to go deeper into the subject, for if statistics is of valid application anywhere, it should be both valid and useful in many physical problems where it is a stranger today. A physicist should be prepared with an appreciation of statistical methods, for his work, some time or other, is sure to involve the description and interpretation of data. It is therefore gratifying to note that the Graduate Schools of the United States Department of Agriculture and the National Bureau of Standards now have courses in modern statistical theory especially designed for the needs of physicists.

For the physicist, the problem of several samples is frequently to decide what value may be given to some physical constant (speed of light, charge on an electron, etc.) in order that calculations can be made with it; this naturally involves the degree of confidence that may be placed in various ranges, and the detection of constant errors by a comparison of experimental

results from two or more laboratories. Birge and Menzel in 1931, in a statistical analysis of the data on the atomic weight of hydrogen, found that certain discrepancies could be explained by the presence of a hitherto unsuspected isotope of mass 2H, present to the extent of 1 part in about 4500. Observers looked for it and found it, and were awarded a Nobel prize for doing so. This is but one example of the fruit of the statistical analyses that Birge has made from time to time during the past twenty years on the status of measurements on various important physical magnitudes such as the charge e of the electron, Planck's constant h, the ratios h/e, e/m, the gas constant R, atomic weights, the ice point, the speed of light, etc., the main object being to point out discrepancies in experimental work on related quantities, or irrationalities in the supposed relations. This work has proved to be valuable in focusing the efforts of theoretical and experimental physicists where they are most needed. A number of perplexing questions have in this way been cleared up, and at the same time, increasingly reliable values of various physical constants have evolved.

The analysis of periodicities, together with statistical tests of their significance, has just undergone a thorough rewriting at the hands of J. Bartels. He and A. G. McNish of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington have developed elegant and powerful devices for dealing with periodicities and trends in geophysical and meteorological observations.

Considerations of causality have brought about in some quarters expressions of reluctance, amounting almost to mistrust, toward some of the newer methods of statistics. In this connection, the name of Norman Campbell of the General Electric Company, Ltd., of London, is perhaps most conspicuous. Having searched the new and even the old developments of probability with characteristic thoroughness, some physicists look askant upon some of the basic assumptions of statistical theory. It seems that no one has bothered to state carefully the assumptions underlying the application of sampling, and it is here that physics properly steps in. Going back to the foundations of the calculus of probabilities, physicists see the terms in the expansion of the point binomial and wonder by what mysteries these can be made into real sampling distributions. For example, it is true that 65.6 per cent of the value of $(\frac{1}{2}+\frac{1}{2})^{10}$ is contained in the fourth, fifth, and sixth terms, but what of it? Of profound significance, we are told by the statisticians; *in the long run* out of 10 random throws of a perfect coin heads will appear 4, 5, and 6 times on an average of 65.6 per cent of the cases. Upon inquiring *how long is a long run?* and *what are random throws?* the physicist discovers that he has made a *faux pas*—such things just aren't discussed. He is perplexed as he recalls from the *Rubaiyat* of Omar Khayyam the lines

> The ball no question makes of Ayes and Noes,
> But Here or There as strikes the player goes;

and wonders if Nature is different now and has become so considerate of man's incapacity to solve the differential equations of motion in the fall of

the coin that it dispenses results in accordance with probability calculations and thereby enables him to predicate upon ignorance.

The physicist has built up a causal world and is suspicious of any formulation that ignores the principles of his success. He realizes the futility of trying to predict rationally the throws of a coin or the outcome of anything left to chance, for in such problems the initial and boundary conditions of the problem are lacking so that a causal solution is precluded; and he is suspicious of any subterfuge based on ignorance. There are physicists who on this basis deny that n observations taken with a piece of apparatus is a statistical problem; they deny that there exists a parent population to be sampled, asserting moreover that even if there were, the mean of a sample of n observations need not approach the mean of the parent population or anything else as n increases, and similarly for statistics other than the mean; to maintain otherwise would contravene the principle of causality. There may be a hitherto unexplained point of philosophy involved; if so, it should be cleared up; until then the usual connotations of sampling distributions and statistical tests must be regarded as immature. This is a real issue, and the necessity of pressing the question is a contribution of physics to statistical theory. Already it has affected profoundly the physical theories of the universe so that we have now two views of probability, the subjective and the objective. Outstanding names in these developments are Bridgman of Harvard, Margenau of Yale, and Reichenbach of Berlin.

In the field of atomic physics it has been found expedient to give probability interpretations to the equations of quantum mechanics. It is important to note that here, as well as in the gas theories of Maxwell and Boltzmann, and in the theory of radioactive disintegration propounded by Bateman in 1911 and just this month generalized by Ruark, probability interpretations are upheld because, and only so long as, they lead *without fail* to experimentally verifiable facts. Thus in dealing with atomic phenomena, physicists use the word probability in a sense quite different from ordinary. For them the principle of causality is still the basis of science.

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A CORRECTION

The article by Dr. Meyer and Dr. Deming in the last issue of the JOURNAL contains a printer's error. (See Vol. 30, page 673.) In equation (2) the numerators of the fractions following the first and last integrals should be interchanged, i.e., the first numerator should be "1" rather than "a" and the second numerator should be "a" rather than "1."

STATISTICS IN CHINESE AGRICULTURAL RESEARCH

Agricultural research has made considerable progress in China during the last few years, particularly in relation to breeding work on wheat, cotton and rice. The University of Nanking has its department of agronomy, with experimental grounds outside the city walls and coöperative stations elsewhere. Assistance in the breeding and biometrical aspects of the work has been furnished by Dr. H. H. Love, of Cornell University, who has spent some years in China. On the economic side notable statistical survey work has been done by Dr. J. Lossing Buck, who is engaged at present on a nation-wide land utilization survey. For an account of the work of this University and other bodies see T. H. Shen: Application of Science to Agriculture in China. (*Proceedings of the Fifth Pacific Science Congress*, 1933, p. 573.)

The National Central University, Nanking, has, like its independent neighbour, a department of agronomy and experiment station, while agricultural research work is also being done at Yenching University, Peiping, and the University of Chekiang, Hangchow, to mention only those places known to me by visits. This latter university is at present being assembled on a new site. The department of agriculture was the first to move into its new buildings, where a generous amount of space has been allotted for experimental work. Other developments that I can speak to concern experimental work on animals, carried out in Manchuria under the auspices of the South Manchuria Railway Company, and economic research at Nankai University, Tientsin, and at the Institute of Social Sciences, Academia Sinica, Peiping.

A knowledge of statistics is required for the reduction of the data of experimental work of all kinds, and particularly for the planning and carrying through of modern field experiments. A great step forward for agricultural research generally, and for statistical applications in particular, has recently been taken by the formation of a National Agricultural Research Bureau under government auspices. Handsome buildings have been erected at Shao-ling-wei, outside Nanking, and the Bureau is organized into a number of departments and adequately staffed with trained men and women. Dr. T. H. Chien, assistant director, organized in the autumn of 1934 courses of lectures and practical work in statistics open to workers from all over the country, including field workers from many coöperative experiment stations whose duty it will be to carry out experiments planned in Nanking. It was my pleasure to lecture to upwards of 250 students, drawn from nearly every province of China.

A statistical section of the department of agronomy has been set up under the direction of Dr. P. C. Ma, formerly of Cornell and Cambridge, England, and the first experiments are in progress on the 250 acre experiment ground adjoining the station. The aim of this section is to aid in the planning of field experiments along the best modern lines, and to provide the machinery

for statistical examination of the results. The section will also act in an advisory capacity to members of all departments on problems of a statistical character.

For the publication of scientific work done the Bureau has its own journal, *Agricultura Sinica*, and also puts out special publications. A number of good papers have already appeared, and they are without exception well printed and carefully edited, particularly with regard to the English typesetting, so often a stumbling-block to the Chinese printer. For the most part the papers are in English, with a Chinese summary, although they may be accepted in French, German, etc., or in Chinese itself, in which case they are provided with an English summary. The Bureau has a well-equipped library of foreign scientific journals and books, including many statistical publications.

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MEETING OF THE INSTITUTE OF MATHEMATICAL STATISTICS

A joint meeting of the Institute of Mathematical Statistics with the Econometric Society and the American Mathematical Society was held at St. Louis on January 2. The program consisted of an invited address, Mathematical Theory of Index Numbers, by Professor Thomas Rawles, and the following additional papers:

1. On certain distributions derived from the multinomial distribution, by Dr. Solomon Kullback.
2. Convexity properties of generalized mean value functions, by Dr. Nilan Norris.
3. The frequency distribution for the mean of n independent chance variables when each is subject to the law $y_0 x^{p-1}(1-x)^{q-1}$, by Professor W. D. Baten.
4. On the admissibility of time series, by Professor Francis Reban.

COÖPERATIVE RESEARCH ON PRICES

A conference to discuss possibilities and means of collaboration in price research was held at the National Bureau of Economic Research on November 29–30, 1935. The meeting was the culmination of a growing feeling that research activities in economics should be more closely coördinated. In 1934 and 1935 the National Bureau had invited representatives of universities and other organizations to conferences to help it map its research program. At the 1935 meeting discussion centered on possible modes of coöperation among research agencies. Two conferences were subsequently held at which it was decided to explore the possibilities of coöperative action in two fields: price research and research on national income. Consequently the National Bureau invited representatives from various agencies interested in price

research and the study of pricing problems to meet for the purpose of discovering the best means of furthering their investigations.

Current projects were summarized and the sections of the field in which more work needs to be done were discussed. It was agreed that an organization which should serve not only to provide information on price studies and developments in the field but which should also consider the formulation of a program of research would be most useful. One important means to real progress in price research was felt to be coöperation with accountants and production engineers for the improvement of cost records. This may well constitute the basis for a long-run program; meanwhile day-to-day problems press for solution. Accordingly the Conference on Price Research was formally organized as a continuing body composed of representatives of the participating universities and research agencies: Universities of Chicago, Pennsylvania, Minnesota, Harvard, and Columbia; Food Research Institute of Stanford University, U. S. Bureau of Labor Statistics, U. S. Bureau of Agricultural Economics, Central Statistical Board, National Bureau of Economic Research. Contacts will be made with other agencies, public and private, and it is hoped that other interested institutions may be added to the membership of the Conference. An Executive Committee was appointed, with the following membership: Anne Bezanson, J. D. Black, R. W. Burgess, F. B. Garver, Henry Schultz, S. W. Wilcox, F. C. Mills, chairman. The National Bureau was requested to serve as the agent of the Conference in receiving and handling funds.

The work of the Price Conference will be of two general types. On the one hand, its Executive Committee will, it is hoped, be able to serve as a steering committee, or general staff, on price research in the United States, in so far as this is possible on a basis of voluntary coöperation. In this capacity it has established a modest secretariat at the National Bureau to manage its affairs, to arrange for periodical summaries of work in progress, and to make available to the members of the Conference reprints of price studies and such basic data and derived measurements as may be secured and handled in this fashion. It will be the duty of the Executive Committee, moreover, to keep itself informed concerning all important research projects in this field in the United States, to provide, on request, advisory services in connection with these projects, to stimulate new projects by calling the attention of suitably placed institutions or individuals to fields inviting research, to explore possibilities for the interchange of personnel among its members, to arrange for the review and appraisal of the data used in price research, and to seek to improve such data through coöperation with federal and other agencies responsible for their compilation. With the coöperation of the important federal agencies and of leading university research groups already assured, the opportunities for extending and greatly improving research work in prices through this joint effort are very promising.

But it is not expected that the Conference will restrict its activities to such organizational and instrumental activities. The Conference, at its first meeting, favored positive action, in collaboration with engineers, managers

and accountants, in the study of actual price changes, cost movements and price-making policies in specific industries and in distributive enterprises. It was recognized that some of the gravest gaps in our knowledge of economic processes are due to inadequacies of data and of analysis respecting costs, prices, and pricing under the conditions actually prevailing in industry and trade today. No great centralized project, calling for large new grants of research funds, is contemplated in this field. It is expected that the investigation of price problems in industry and trade will be conducted coöperatively, by the groups affiliated with the Conference, and that several studies centering on specific industries will be financed by funds provided by the individual institutions. The Conference on Price Research is eager to promote such a coöperative attack upon problems of vital concern alike to business men and to economists.

Success in the study of the price problems of industry and trade will depend in large part upon securing the active coöperation of accountants, engineers and men actively engaged in formulating the price policies of American business enterprises. As a first step in this enterprise, the Executive Committee of the Price Conference proposes to call a conference of representatives of these groups, and of interested economists.

As circumstances permit, it is expected that the Conference will actively support other research projects. Meanwhile, it will attempt to give unity and force to the activities of research workers in this field throughout the country, and to stimulate the accumulation, on a broader and sounder basis, of the factual material essential to the success of such research.

CONFERENCE ON NATIONAL INCOME AND WEALTH

Increasingly aware of the values that lie in its collaboration with other research agencies, the National Bureau followed up its conference on price research with one on national income and wealth. The primary task was to afford the students in these fields the opportunity of becoming more familiar with the work in process or contemplated at the various institutions of discussing the various conceptual and statistical problems raised by the current studies, and of arriving at a common opinion as to what projects relating to national income and wealth seemed most urgent and most practicable for coöperative attack. The conference was held at the National Bureau on January 31 and February 1, and included representatives from the Universities of Harvard, Chicago, Columbia, Minnesota, and Wisconsin; from the Central Statistical Board; the Bureaus of Foreign and Domestic Commerce, of Agricultural Economics, of Labor Statistics; Division of Research and Statistics of the Treasury; Division of Research of the Federal Reserve Board; Consumers' Expenditures Study of the Industrial Division of the National Resources Committee; and the National Industrial Conference Board.

Upon preliminary discussion, the problems in the field were grouped for more intensive analysis by three committees: one to deal with objectives, concepts and terminology; the second to explore questions of data and pro-

cedures, arising in the estimates of national income and related wealth items by industrial sources and by type of payment; the third to discuss areas of the income and wealth fields still largely unexplored, i.e. primarily distribution of income by size among individuals or families, regional distribution of income, and estimates of wealth and their different classifications. Each committee made definite recommendations, some of which are listed below. The first committee recommended the establishment of a set of bench-mark years (1899, 1909, 1919, 1929, 1935) for which specially detailed breakdowns of income and wealth estimates could be provided, these detailed estimates being intended as guides with which reconciliation could be attempted by students in the field. Another recommendation of the first committee was that, as part of a continuing organization, a section be provided to act as a clearing house for proposed terminology and concepts and schemes of classification. The second committee commented upon the inadequacies of the industrial and type-of-payment classifications now employed, and recommended a careful consideration of the problems of these classifications by a continuing coöperative organization. This organization should attempt to stimulate both the data-collecting authorities and students in the field to fill gaps or remedy inconsistencies in the currently available data; and to devote more attention to those parts of the economic system, such as government and finance, in which income and wealth estimates encounter especially acute conceptual problems. The third committee emphasized the importance of obtaining a reliable distribution of income and wealth by size among individuals and families continuous for a number of years, and the advisability of combining it with a regional classification. It called attention to the state income and other tax data available in the files of state agencies, and to other relevant data which are not regularly published by the authorities collecting them and recommended a preliminary exploration of these fields, prior to the organization of a coöperative research project that would attack the problems directly. These recommendations, among others, were adopted by the Conference after prolonged discussion.

Towards the ends of defining objectives, clarifying concepts, and making and stimulating studies in the field, a continuing organization, to be known as the Conference on National Income and Wealth, was set up on a basis similar to that of the Conference on Price Research, and for similar purposes. To carry these out an Executive Committee composed of Simon Kuznets, chairman; M. A. Copeland, W. L. Crum, Aaron Director, H. M. Groves, A. W. Marget and R. R. Nathan was elected.

SPECIAL STUDIES ON STATISTICS OF INCOME

The Treasury Department is conducting a number of special studies, the results of which may be of considerable interest to students of the amount and distribution of the national income, corporate profits, and sources of individual incomes. These studies may be listed under three heads:

I. *Revision of Individual Income Tax Forms.* The Division of Research and Statistics, in coöperation with the Bureau of Internal Revenue, is studying the advisability of a revision of the individual income tax forms. The main objective, from a statistical point of view, is to provide a definition of net income for analytical purposes independent of the changing legal definition for tax purposes. In addition, such a change would eliminate the recurring breaks in the comparability of income statistics from one year to another, of which the most recent example relates to the amount of capital net gain or loss included in income for tax purposes.

The main problem is to determine what items to include in gross income and what deductions to make in arriving at net income, for purposes of economic analysis. The most difficult decision relates to the treatment of capital gains.

II. *Compilation of Hitherto Unavailable Data.* The Treasury has never compiled and published all the information contained in the income tax returns. Now and again some of the unpublished material has been utilized by special investigators, but this has involved going over all the records in order to extract the necessary data. A small portion of an appropriation under the Works Progress Administration is therefore being utilized to put much of the hitherto unavailable data in useful form. The work plan may be outlined as follows:

Corporations

1. *Statistics of Income for 1933*, Table 13. Corporation returns by major industrial groups relating to income and tax items.

This table will be expanded to show identical data for 91 minor industrial groups in each of the 51 States and Territories.

2. *Statistics of Income for 1933*, Table 15. Returns of corporations submitting balance sheets for 1933 by major industrial groups, showing balance sheet as well as tax information.

This table will be expanded to show for the asset and liability items identical data for 91 minor industrial groups in each of the 51 States and Territories.

3. *Statistics of Income for 1933*, Table 16. Returns of corporations submitting balance sheets for 1933 by total assets classes, showing additional balance sheet and tax information.

This table will be expanded to show identical data for 21 major industrial groups.

4. *Statistics of Income for 1933*, Text table (page 33). Consolidated corporation returns for 1933 by major industrial groups, relating to income or deficit.

This table will be expanded to show items identical with Table 13 and with Table 15 for 91 industrial groups.

5. Compilation and publication of data on salaries and wages reported as a deduction on corporation returns on Lines 2(c), 5(a), 16 and 24, by 91 industrial groups. (Not now included in *Statistics of Income*.)

Individuals

1. *Statistics of Income for 1933*, Table 9. Returns by States and Territories and by net income classes, giving number of returns and net income together with tax information.

This table will be expanded to include sources of income and deductions identical with sources and deductions shown in Table 6.

2. *Statistics of Income for 1933*, Table 4. Returns by States and Territories from the point of view of sex and family relationship.

This table will be expanded to show data by net income class for each State.

The foregoing outline applies only to 1933. There will be some variation of it with respect to other years, as identical detailed classifications and tabulating procedure did not apply throughout the years. It is not possible at this time to estimate the number of years for which the work sheets may be transcribed, but it is hoped to cover all years from 1926–1934.

III. *A More Comprehensive Presentation of 1934 Individual Income Tax Data.* With an appropriation from the Works Progress Administration, the Division of Research and Statistics is now carrying on a comprehensive tabulation of the 1934 individual income tax returns. It is well known that, at present, compilation of "Statistics of Income" is based on approximately 20 per cent of the returns showing net incomes under $5,000, as selected by the various Collectors of Internal Revenue, and on all returns showing net incomes of $5,000 and over. An incidental result of the study will be a test of the adequacy of the present method of selecting the sample each year, but more significantly, a special study will provide more detailed information than is now available on the distribution of income, and on sources of income and deductions.

1. Tables will be provided showing sources of income and deductions by income classes for counties and certain large cities similar to tables now published for the country as a whole.

2. Correlation tables will be provided so that frequencies of sources of income and deductions as well as frequencies of net income will be shown.

3. The income distribution will be presented in smaller class intervals than is now done—as small as $100 for net incomes under $3,500.

4. The capital gain schedules will be tabulated separately in order to

clarify the effects of the tax provisions on capital gains and losses in the Revenue Act of 1934.

5. The Division is attempting to classify all the individual returns according to occupations and industries. However, the nature of the information on the returns casts some doubt on the reliability of the final results.

6. Separate returns filed by husbands and wives will be matched in order to determine the sources of income on such returns and the effects of such separate returns on tax liability.

7. The partnership returns for the years 1931–1934 will be tabulated, and will be so classified as to conform (as nearly as possible) to the corporate returns.

8. The fiduciary returns for the same years will also be tabulated.

9. Tentative plans exist to make a special study of changes in the distribution of income of identical individuals for the period 1930–1934, and a study of identical corporations for the same period. If these plans materialize, special emphasis will be placed on the distribution of corporate income and changes in depreciation allowances.

10. To supplement its information on the distribution of income in the lower ranges, the Treasury is endeavoring to obtain a tabulation of State income tax returns in a few States where the exemptions are lower than they are under Federal laws.

GEORGE C. HAAS
Director of Research and Statistics

Treasury Department

PLANS FOR A STUDY OF THE CONSUMPTION OF GOODS AND SERVICES BY AMERICAN FAMILIES

The need for an investigation into the manner in which American families spend their incomes has long been recognized, both by Government agencies and by private organizations. In 1929 the Social Science Research Council emphasized this need in its outline of a proposed study of "Consumption According to Income." During the past five years, the maladjustment between the nation's producing power and its actual consumption has stressed still further the importance of basic data on the consumption habits and needs of the population.

An extensive Study of Consumer Purchases, designed to furnish such data, is now being undertaken as a Federal Works Project. The plans for the investigation have been developed jointly by the Consumption Research staff of the National Resources Committee, the Cost of Living Division of the U. S. Bureau of Labor Statistics and the Economics Division of the U. S. Bureau of Home Economics, with the coöperation of the Central Statistical Board. The project will be administered by the Bureau of Labor Statistics and the Bureau of Home Economics. A Steering Committee, composed of representatives of the coöperating agencies, will guide and coordinate the study.

The data collected in the survey will be obtained in part through a short sampling schedule, covering a random sample of about 336,000 families. This schedule will provide information on family income during the past year, on the occupations of members of the family gainfully employed, on family composition and on type of housing. A longer schedule, covering information on expenditures and savings during the year, on ownership of important types of durable goods and on other aspects of consumption, will be secured from a controlled sample of about 53,000 families, drawn largely from the random sample.

From about 3,000 of the families included in the controlled sample, records of food consumption will be secured, to provide accurate data on the nutritive adequacy of the diet. These records will be kept for one week at each season during the year following the scheduling. They will be accompanied by records of the incidence of sickness of the members of the family, in order to make possible an analysis of the relation of diet and health.

The study has been planned from the viewpoint of the analysis of the data. At each step in the procedure, therefore, a selection has been made of the factors considered most significant in determining the consumption habits of the population, and the sample has been concentrated so as to permit clear-cut comparisons with respect to these factors.

THE COMMUNITIES SELECTED FOR THE STUDY

In accordance with this policy, the communities included in the study

have been selected not to "represent" the country as a whole, but to make possible comparisons between different geographic areas, between different degrees of urbanization and, in the farm sample, between different types of farming.

The study will be restricted, in the main, to six areas of the country, each fairly distinctive and homogeneous with respect to geographic and cultural characteristics. These areas, and the States included in them, are:

1. The East Central area, including Illinois, Indiana, southeastern Michigan, Ohio, Pennsylvania, and southern Wisconsin
2. The New England area, including Connecticut, Massachusetts, Rhode Island, and Vermont
3. The Southeast area, including Alabama, Georgia, Mississippi, North Carolina, and South Carolina
4. The West Central area, including Iowa, Kansas, Missouri, and Nebraska
5. The Rocky Mountain area, including Colorado, Montana, Utah, and Wyoming
6. The Pacific Northwest area, including western Oregon and western Washington

In each of these areas, communities have been selected to permit comparisons of consumption patterns for five distinct degrees of urbanization—the large city, the middle-size city, the small city, the village and the farm community. In addition, two very large cities—New York and Chicago—have been included, to provide a picture of metropolitan living.

The range of population for each degree of urbanization has been restricted within fairly narrow limits, to make it possible to isolate the effect of this factor on consumption. The number of communities of each size range needed within an area was determined on the basis of the number of cases required for analysis by income, occupation and other significant factors, and the number of families of the desired types available in the community. One large city was found sufficient for each area, two or three middle-size cities, four or more small cities, and ten or more villages.

The size ranges of the communities selected and the total number of communities of each type are as follows:

	Number	Population Range
Metropolises	2	3,376,000–6,930,000
Large cities	6	253,000– 302,000
Middle-size cities	14	31,000– 72,000
Small cities	28	9,000– 19,000
Villages	126	500– 3,000

In choosing the particular communities to be covered in each area, the first essential condition was that they be located within the size ranges selected. The factor next in importance was that of obtaining communities representative of the economic activities of the area. In addition, various other factors were considered for each city—its independence of adjacent larger cities, its rate of growth, its density of population, the proportion of

foreign-born families, the percentage of families on relief, its inclusion in earlier studies of family living. The six large cities selected are: Columbus (Ohio), Providence, Atlanta, Omaha, Denver, and Portland (Oregon).

The farm sample has been selected to represent the major types of farming throughout the country. In all, fifteen farm types will be included, each type being distinguished by a high degree of uniformity in the kind and relative amount of crops or livestock and in the methods and practices followed in production.

The sample will be drawn from 18 rural sections within the six main areas covered by the study and from four sections located outside of these areas. In all except three of these sections, a village sample will also be covered, so as to permit comparison of consumption patterns under similar geographic environment.

THE CONTROLLED SAMPLE

The basis of the study is the controlled sample of families from whom the expenditure schedule will be obtained. This sample will be limited to families satisfying certain conditions and will be selected according to a prearranged plan, assuring for each community an equal number of families of each family composition type at each income level for each occupational group.

Such a controlled sample has four important advantages:

First, it greatly facilitates clear-cut analysis of the factors affecting consumption, by providing for an extremely homogeneous sample through the exclusion of families who would otherwise blur comparisons.

Second, it provides sufficient cases at the extremes without a needless number of cases for the modal groups. It thus secures, in an economical way, much needed information for the rarer occupational and income groups.

Third, it yields a more accurate estimate of the mean of the sample as a whole than would a random sample of the same size. The mean of a random sample is subject to errors of two kinds—errors in the values of the variate studied as well as errors in the distribution of families. The mean of the controlled sample, on the other hand, is very much less subject to the second source of error, since the distribution of families will be quite accurately known from the larger sample of families from whom sampling schedules are obtained.

Fourth, it provides more reliable results than a random sample of the same size, for those analyses of the data in which regression lines are used, since a regression coefficient derived from a controlled sample has a smaller standard error. This is a result of the more even distribution of the observations from the controlled sample.

The conditions which a family must satisfy in order to be eligible for the controlled sample fall into two groups: the basic controls, including those factors whose influence it is desired to isolate, and the minor eligibility requirements, including those factors whose influence it is desired to eliminate in order to purify the sample.

The basic controls are:

1. *Nativity and Color.* The sample is largely restricted to native white families. Negro families, however, will also be included in all of the cities and villages in the southeast area, in four of the five farm sections in this area, and in New York City and Columbus, Ohio. The inclusion of the negro sample will make it possible to analyze the differences in the consumption patterns of white and negro families, as well as to compare the consumption of urban and rural negroes in the South with that of the negro in the North.

2. *Occupation.* The sample will cover the following seven occupational groups: wage-earners, clerical workers, other salaried workers (both professional and business), entrepreneurs (both professional and business), retired persons, farmers in villages and farm operators. The sample of retired persons will be included only in the East Central area. It is also planned, if time permits, to obtain data from a sample of families who have been on relief.

3. *Income.* The range of incomes which will be studied has been selected separately for each occupational group for each degree of urbanization; in each case the incomes selected will cover the entire range within which it seems feasible to seek sufficient cases for statistical treatment. Intervals of $250 are used for annual incomes of $2,500 or less, making ten classes; from $2,500 to $5,000 the step interval is $500, making five classes; between $5,000 and $10,000 there are two classes, each of $2,500 range; and between $10,000 and $25,000 there are three classes, each of $5,000 range. Thus there are 20 income classes altogether.

4. *Family Composition.* The number of family types covered is different for different communities. In most of the communities the sample will cover five family types, ranging in size from two to six persons and including only "normal" families—that is, families with a husband and wife. One group of communities, located mainly in the East Central area, has been selected for a detailed study of the influence of family composition on consumption patterns. The sample for these communities has been intensified by including two additional family types, one with five or six persons, the other with seven or eight persons, and by providing for a larger number of families per type. In three large cities single individuals will also be sampled.

The size of the controlled sample is dependent on the number of cases in the final breakdown or "cell" composed of families of a given income class, occupational group and family composition type, living in a given type of community. In the non-intensified communities 30 families covering five family types, with six cases of each type, will be obtained at each income level. In the intensified area the number of cases has been increased to 70 at each income level, with 10 cases for each family type.

The number of cases needed in each cell for analysis of the influence of the factors affecting consumption was decided on after a careful study of available data. It is expected that the averages for the 30 cases at each income level in the non-intensified areas will be sufficiently reliable for the major groups of commodities and services and possibly for some of the individual items. For most of the items, however, it will be necessary to pool adjoining cells. In the intensified area the averages for the 70 cases at each

income level will be sufficiently stable for most, if not all, of the individual items, but for analysis by the separate family types it will ordinarily be necessary to combine adjoining cells.

Of the total number of families included in the controlled sample 34,000 will be from the urban, and 19,000 from the rural communities.

THE RANDOM SAMPLE

The random sample of families from whom the sampling schedule will be obtained forms a very valuable adjunct to the controlled sample. It greatly facilitates the selection of the controlled sample and it provides information on the distribution of families by income, occupation, and family type which is extremely helpful in the interpretation and analysis of the more detailed data collected from the controlled sample.

The random sample will be restricted to the nativity and color groups included in the controlled sample. It will include, however, all income levels, all occupational groups and all family composition types. In the farm sections it will include only families engaged in the type of farming the section was selected to represent.

The size of the random sample has been determined by the requirements that it furnish most of the controlled sample, that it yield reliable weights for use in computing estimates of the total consumption of the groups studied, and that, for ease in sampling, it cover a simple percentage of the total number of families in each community. On the basis of these considerations a total sample of 233,000 urban and 103,000 rural families has been decided on. This provides for a 5 per cent coverage in New York, 10 per cent coverage in Chicago, 25 per cent coverage of the large cities, 30 per cent coverage of the middle-size and small cities, 90 per cent coverage of the villages and 25 per cent coverage of the farm sections. The percentages refer to the number of families of the nativity and color groups included in the random sample in each community. The more complete coverage of the villages was decided on because of the lack of available data on the composition of villages.

SAMPLING PROCEDURE

Theoretically, the best sampling procedure for the purpose of the study would be to canvass each community first with the sampling schedule and then to select each cell of the controlled sample at random from the sampling schedules which have been classified into the desired breakdowns. This procedure, however, has practical disadvantages resulting from the fact that a period of one or more months would be required to obtain the random sample of the desired size. The random sampling period will, therefore, be divided into two or more periods, each of which will be followed by a period in which expenditure schedules will be taken.

In communities where a native white sample only will be obtained, no sampling will be done in sections which are predominantly negro or foreign-born and where the number of native white families is too small to compensate for the cost involved in sampling them. Similarly, in the farm sec-

tions, no sampling will be done in those parts which are characterized by a type of farming other than the one studied in the particular section.

A report card will be filled out by the enumerator for every family that has been approached and a record of all refusals will be obtained. It will thus be possible to test the randomness of the sample and to detect any bias in the sample due to the unwillingness of certain population groups to coöperate.

It is expected that approximately 80 per cent of the controlled sample will be obtained from the random sample. The remaining 20 per cent will be obtained by stratified sampling, the characteristics of the stratification depending on the types of families which have not been obtained in sufficient numbers from the random sample.

TABULATION AND ANALYSIS

For both samples covered by the study the basic cross-tabulations are determined by the controls of the sample of families from whom the expenditure schedules are taken.

Since the controlled sample is random only within cells but not as between cells it is not possible to reclassify the families by criteria other than these controls. Within each cell the number of cases is so small that additional cross-tabulations will not be feasible.

The random sample must be cross-tabulated in such a way as to yield the weights which are necessary to combine the results from different cells and thus to reconstruct the consumption of different groups of families from the data obtained from the controlled sample. This means that the basic cross-tabulations must be the same as for the controlled sample. However, due to the larger number of cases within a cell and to the completely random nature of the sample, additional tabulations can be made. These will include tabulations within the basic controls as well as re-sorts of the whole sample for special analyses.

The analysis of the data will largely be concerned with the measurement of the influence of the factors affecting consumption patterns. Thus the relationship between the expenditures on individual commodities or groups of commodities and family income will be derived for each occupational group, while holding family type constant. The results will then be compared for the different occupational groups to determine whether occupation affects the relationship between income and expenditures. Similar comparisons will also be made between degrees of urbanization and geographic areas.

The aspects of family living other than expenditure will be analyzed to show the variation between different groups of families. Special analyses of the influence of family type will be made with the data secured in the intensified area.

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PROGRESS OF WORK IN THE CENSUS BUREAU

A TEN-YEAR PROGRAM FOR THE CENSUS BUREAU

The time is near at hand when legislation must be enacted providing for the next decennial census, to be taken in 1940. There is need also for a revision of the legislation regulating and defining the intercensal and current work of the Bureau. That being the case, the Bureau has had under consideration a plan for a single comprehensive bill codifying the existing census laws and providing at the same time for a unified ten-year program of census inquiries. The fundamental idea is to have comprehensive statistical surveys every fifth year and limited compilations of data every year. Most of the comprehensive censuses now conducted by the Bureau are on a decennial basis. Two, however, the census of agriculture and that of electrical industries, are already quinquennial; and one, the census of manufactures, is biennial. Under the proposed plan most, if not all, of the principal censuses would be placed on a quinquennial basis, and be supplemented by annual compilations of limited scope to bridge the gap between the quinquennial inquiries.

One objective of the plan is "to time and coördinate census inquiries so that those which are most closely related in subject matter or in organization of the field service may be conducted together" or in the same year. It is pointed out that there are two main groups of inquiries: one, economic relating to business or industry, and the other, social or demographic. It is proposed that the major social inquiries, including the census of population, be conducted in the years ending in 0 and 5, and the economic inquiries in the years ending in 2 and 7. This plan, it may be noted, contemplates a quinquennial census of population and does away with the present biennial census of manufactures, replacing it by a quinquennial census. The census of agriculture would be included with the census of population because of the close association of the field work of the two censuses.

The plan is designed "to attain greater administrative efficiency in the Bureau of the Census by the spreading of the major inquiries throughout the decade and the instituting of annual series linking the general censuses thereby attaining a more even work load." No other public agency is subject to as extreme fluctuations in personnel and activity as the Bureau of the Census. In the period of the decennial census the office force increases from a normal of about 800 employees to a peak of about 6,500. The new plan would reduce the decennial peak, or rather substitute for it smaller quinquennial peaks.

The Census Advisory Committee at its meeting in November after considering this plan adopted the following resolution:

> RESOLVED that the Committee favors a quinquennial census covering population, agriculture, and such other related subjects as it may be desirable to include, scheduled for the years ending in "0" and "5"; also a quinquennial census of manufactures, mines and quarries, power units, communication, transporta-

tion agencies, trade, and services for the years ending in "2" and "7"; also the plan of making such annual compilations as will preserve the continuity of the data obtained in the quinquennial censuses and minister to the needs of other governmental and private agencies by the more frequent reporting of some of the basic data.

THE 1935 CENSUS OF MANUFACTURES

The scope of the biennial censuses of manufactures for 1931 and 1933 was considerably curtailed as compared with that of prior censuses; but the manufactures census for 1935 will be as comprehensive and detailed as that for 1929, which was taken in connection with the Fifteenth Decennial Census. The inquiries of a general character, applying alike to all manufacturing industries, include all those that were in the 1929 census; and one general inquiry—that pertaining to employment—has been amplified to provide for reporting the number and total compensation of technical employees as a separate group (comprising chemists, electrical and mechanical engineers, designers, etc.), and for reporting also the number of clerical employees on the rolls in March, June, September, and December. The wage-earners will be reported for each month, as in prior censuses.

The general inquiries covered by the census of 1929 but omitted in the 1931 and 1933 censuses and now restored, include fuel, power equipment, electric energy, and distribution of sales. The "special" industry schedules —covering 261 of the 310 industries distinguished in the census classification —are similar to the corresponding schedules used in the 1929 Census. In general, the amount of production detail—quantities and values of individual kinds or classes of products—called for is about the same. In some cases, however, the inquiries covering kinds, quantities, and cost of principal materials consumed, and those covering equipment in use, which appeared on certain of the 1929 schedules, are not carried on the corresponding schedules for 1935. These are practically the only respects in which the 1935 schedules have been curtailed as compared with those used for 1929.

The experiment of using an abridged schedule for the small establishments, which was made in the Census of 1929 and to a greater extent in that of 1933, yielded very unsatisfactory results and will not be repeated in the 1935 Census.

The field work for the census of manufactures has been consolidated with that for the census of business. The canvass is being made by the same corps of enumerators working under the same supervision. Schedules have been mailed to all manufacturers whose names appear on the census list, with instructions to fill them out and hold them until called for by canvassers. This is an innovation. Heretofore it has been the practice to request manufacturers to send in their returns by mail, and to depend on canvassers to visit only those manufacturers who failed to do so within a reasonable time.

THE 1935 CENSUS OF AGRICULTURE

The plans for the 1935 census of agriculture were described briefly in the December, 1934, issue of the JOURNAL. The canvass was begun on January 2, 1935, and was completed by April 1. By the end of the year the machine

tabulation for the first series of printed state bulletins covering the principal crops and classes of livestock had been completed; and of the 44 bulletins that had been prepared for the printer, 34 had been printed comprising figures for 2,665 of the 3,070 counties in the United States. A second series of state bulletins is being prepared covering farm population, mortgages, chickens and eggs; but it will be several months before this is completed.

In this census a much wider use has been made of the preliminary county press releases than ever before. The Demonstration Service of the Department of Agriculture has a county agricultural planning program based upon the county census figures; and because of this and other important agricultural programs, local papers have published the results quite widely. The county releases are prepared in news form suitable for popular reading. State statisticians and county agents have placed requisitions for large numbers of these summaries.

The final volume of the census containing the first series of state bulletins will be printed before the end of this year.

A NEW POLICY AS REGARDS REGISTRATION TESTS

The Bureau of the Census, ever since it was entrusted with the compilation of vital statistics under the permanent census Act of 1902, has endeavored to establish and maintain a standard of 90 per cent completeness in the registration of births and deaths. One by one the states, as determined by such tests as were applied, have reached this standard and been admitted to the registration area. In a few instances a state after being admitted has been dropped for failing to maintain the standard but has later been restored. So at the present time all states are within the area.

The Bureau must continue to make tests to check the completeness of the registration; but the object of such checks hereafter will be to help the state with its problems of registration rather than to threaten its removal from the registration area. The public must be educated to this new point of view. Regardless of whether a state measures above or below the accepted standard of 90 per cent completeness, the data should be compiled and published for scientific investigators; and the users of vital statistics can then correct the data for each state according to the relative completeness of registration as ascertained by satisfactory tests.

In view of this new policy, the need for better methods of determining the completeness of registration becomes one of the most urgent problems confronting the Division of Vital Statistics. Coöperative effort will be required to develop sampling or other methods which will be relatively inexpensive, which can be repeated in each state year after year, and which will be both unbiased and dependable. On the basis of such tests, the states can be compared and the backward states encouraged and aided to build up and perfect their systems of registration.

J. A. H.

CHAPTER ACTIVITIES

THE ALBANY CHAPTER.—Dr. Albert H. Hall, Director of Training and Research for the Mayors Conference, spoke before the Albany Chapter on January 23, 1936. The subject of his discussion was "Statistical Facts about the Municipal Tax Dollar."

THE BOSTON CHAPTER.—The eighth annual meeting of the Boston Chapter was held at the Boston Chamber of Commerce on December 16, 1935. The President, Howard C. Baldwin of Babson's Statistical Organization, presided. The subject of the evening's discussion was the Social Security Program, with special reference to Unemployment Compensation in Massachusetts. Judge Emil E. Fuchs, Chairman of the Massachusetts Commission on Unemployment Compensation, outlined the provisions of the unemployment compensation act and indicated a number of difficult problems confronting the Commission. Mr. Robert J. Watt, a member of the Massachusetts Commission on Unemployment Compensation, discussed the social security program from the point of view of labor and answered questions presented by the members.

Professor D. S. Tucker of the Massachusetts Institute of Technology, was elected President of the Chapter. Roswell F. Phelps was reëlected Secretary-Treasurer. The Secretary of the American Statistical Association, Frederick F. Stephan, presented briefly new developments in the activities of the Association.

THE CHICAGO CHAPTER.—On November 18, 1935, the Chapter had a dinner meeting on "Measuring Market Potentials in the Post-Depression Period." The principal speaker was Mr. L. D. H. Weld, Vice President and Director of Research of McCann-Erickson, Inc.

"Upturn or Pending Breakdown in Europe?" was the subject of a meeting on December 11, 1935, addressed by Dr. Melchior Palyi, Visiting Professor of Economics, University of Chicago. At this meeting the Grain Market Analysts Club and the Investment Analysts Club met with the Chapter.

THE NEW YORK DISTRICT CHAPTER.—A dinner meeting of the New York District Chapter was held on November 21, 1935, with a program on the general topic, "New Mechanism of Banking and Credit Control." George E. Roberts, Economic Advisor of the National City Bank of New York, was the presiding officer. J. H. Riddle, Economist of the Bankers Trust Company, discussed "The Trend of Bank Assets and Deposits." "Problems of Banking and Credit Policy" were discussed by Alexnder Sachs. Professor Oliver M. W. Sprague of Harvard University spoke on "The Problem of Credit Control." The discussion was led by Frederick Macaulay, of Bernstein-Macaulay, and Willard L. Thorp, Director of Economic Research, Dun & Bradstreet.

THE PITTSBURGH CHAPTER.—The October meeting of the Pittsburgh Chapter was addressed by James Steele Gow, Executive Director of the Falk Foundation. Mr. Gow's subject, "Income and Economic Progress," covered the high spots of recently completed economic studies of the Brookings Institution.

On December 5, Theodore A. Veenstra presented the results of a study of "Regional Shifts in the Bituminous Coal Industry with Special Reference to Pennsylvania" undertaken by the Bureau of Business Research of the University of Pittsburgh.

The 1935 Annual Meeting of the American Statistical Association was reviewed by members of the staff of the Bureau of Business Research at a meeting of the Chapter on January 9, 1936. On January 23 the Chapter met with the Pittsburgh Personnel Association to discuss the Social Security Act.

THE SAN FRANCISCO CHAPTER.—Dr. E. F. Penrose, Professor of Economics at the University of California, addressed the San Francisco Chapter at a dinner meeting on October 24, 1935. His subject was "Business Depression and Recovery in Japan." He pointed out that after the collapse of the war boom Japan experienced a severe depression from which it has only partially recovered. Rice cultivation occupies a leading place as a source of income to Japanese farmers. The marked growth of production in Japanese colonies of varieties of rice acceptable to Japanese consumers and produced at lower costs than the greater part of the Japanese crop, together with an uneconomically small unit of operation in Japanese agriculture, adversely affected Japanese farmers long before the great world depression began. The raising of silk cocoons and the production of raw silk were also large sources of income to Japanese farmers, but the competition of rayon and mixed fabrics was felt even before the great depression. Progress was being made in cost reduction and it is unlikely that apart from the world depression any catastrophic decline would have taken place. These unfavorable tendencies were offset to some extent by the steadily improving prospects of cotton textile exports. In addition domestic production was replacing imports of woolen textiles and the foundations of the rayon industry were being laid. The potential strength of Japanese industry was underestimated in Western countries.

Financial difficulties have been endemic in Japan and were intensified by the aftermath of war inflation. After the depression of 1921, a substantial divergence between the relative positions of Japanese wholesale prices on the one hand, and American and British wholesale prices on the other, with respect to their pre-war levels, indicated that a considerable, though by no means identical, shift had taken place in the equilibrium rates of foreign exchange. Through most of the post-war decade the yen exchange was supported "artificially." The available evidence seems to indicate that the domestic prices of some productive factors, goods, and services were not adjusted to the pre-war exchange parity which was reëstablished when Japan returned to gold in 1930. The resulting difficulties were intensified by the

rapid deflation in other gold standard countries which characterized the world depression. The situation was complicated by the startling fall in the price of silver and the appreciation of the yen with reference to the Shanghai tael. Japanese economic enterprises in Manchuria as well as those in Japan were adversely affected.

Deep depression prevailed in Japan during a large part of 1930, the whole of 1931, and a large part of 1932, throughout agriculture, industry and domestic and foreign trade. At first raw silk was most seriously affected, owing to the great fall in American incomes and the overvaluation of the yen abroad. In 1930 losses in exports were concentrated mainly on raw silk, silk piece goods, and cotton piece goods. In 1931 the further substantial decline was widely diffused. The worst year of the depression in Japan was 1931. In yen values, exports of raw silk and silk piece goods fell to the lowest levels reached since 1917 and 1915 respectively.

In 1932 Japan's foreign trade began to recover and in 1933 the recovery became very rapid. This was correlated with a revival—after a time amounting to a boom—in manufacturing industry. But neither the revival nor the boom extended to agriculture, which remained depressed even in comparison with the far from favorable position it occupied before the world depression began. Notwithstanding the spectacular increase in the activity of manufacturing industry and export trade, there has been no such well-balanced, all-round recovery as in Sweden.

The continued depression in agriculture has been associated with conditions affecting rice and raw silk. In the second half of 1932 and for a few months in 1933 the raw silk outlook appeared to be improving but a new collapse occurred in the late autumn of 1933. The depreciation of the yen contributed to the improvement in 1932 but this advantage was lost in 1933 owing to the depreciation of the dollar. Other factors contributed to the collapse in 1933. American rayon, cotton, and mixed fabrics have encroached on demand for silk in America and the Japanese rayon industry has encroached on domestic demand. Silk will not be completely deposed by other fabrics, but mulberry growers, cocoon raisers and raw silk producers in Japan will have to adapt themselves to a low level of prices and pay their way by keeping costs low, on account of elastic demand due to possibilities of substitution. Improved technique enables more fibre to be derived from a given quantity of cocoons and mulberry growing and cocoon raising are hardly likely again to afford so large a supplementary income to farm families as in the pre-depression period.

The plight of rice growers is due to intensified competition from low cost producers in Japanese colonies and to abnormal fluctuations in yields per acre since 1929, due mainly to natural causes. The two largest crops in history were harvested in 1930 and 1933; the smallest since pre-war times in 1934. The Rice Act, which gives the government power to buy, store, and sell rice, was amended in 1930 and 1933 and buying operations have been carried on in large volume during the depression. Stocks have been large and costs of storage and losses due to deterioration substantial. The levels at

which it was sought to maintain rice prices are above those which would equate supply and demand in a long period. The Rice Act is costly to the taxpayer and fails to deal with the roots of the difficulties faced by rice producers.

The remarkable expansion of manufactures has been associated with increasing exports. A profound change has taken place in the composition of Japanese exports. Exports of raw silk, a semi-manufactured article made from domestic raw materials, have declined greatly in value, while exports of goods made from imported raw materials and in an advanced stage of manufacture, and of goods ready for final consumption, have greatly increased. In 1929 the total value of raw silk exports was nearly double that of exports of cotton goods. By 1934 cotton goods had gained a long lead over silk. The rayon and woolen industries have greatly expanded during the depression and advanced into export markets. These changes appear to be permanent in character, and involve considerable change in the economic structure of Japan. Increased exports have not been confined to textiles other than silk, but embrace a variety of articles the aggregate values of which are important.

The changes in the composition of Japanese exports have conferred substantial benefits on raw material producers in various parts of the world. Imports of raw cotton and wool into Japan have been substantially larger in physical quantities since 1932 than they were in 1929. The same thing is true of iron, rubber, cotton, tin, and mineral oil. Low priced exports from Japan have forced producers abroad to giving increased attention to cost reduction and in part have created an effective demand for certain goods among consumers who formerly, because of low incomes, were forced to dispense with such goods.

Successes of Japan in export markets may be attributed to currency depreciation in some cases, but other more fundamental factors are involved. Technical improvements within the factory and improvements in the organization of industries, an abundant supply of power due to the remarkable development of the electrical industries, the centralization of marketing and raw material purchases in a few large units, and low wages have all played a part. There is undoubtedly much "exploitation" of labor in Japan in the sense that collective bargaining is little developed and is often suppressed when attempted by labor organizations. But the tendency in Western circles to identify low wages exclusively with the results of such exploitation is absurd. By far the most important reason why wages in Japan are low in comparison with wages in America, England, Australasia, and Scandinavia, is the fact that in relation to the supply of other factors of production, the supply of labor is much greater in Japan than in the Western countries in question. Relatively low wages in Japan are therefore inevitable under existing conditions, in any social system.

Up to January, 1932, Japanese financial policy in the depression was dominated by conscious pursuit of deflation. At a time when official spokesmen in America asserted that business was "sound" and urged investment,

official spokesmen in Japan exhorted the people to tighten their belts and prepare for additional sacrifices. In January, 1932, this policy was abandoned and following departure from the gold standard an expansionist policy was embarked on. Budgetary deficits have been met by loans. The volume of securities held by banks has greatly increased. The national debt has practically doubled. Bank deposits have increased considerably, but loans and discounts have actually contracted, especially during the period of recovery. The export industries which have expanded most had a large unused capacity during the depression and even now are not producing to capacity; their financial policy has been more conservative than it was before the depression, with the result that they appear to have been in a position to finance expansion largely without resort to the banks. Moreover some industries have benefitted greatly from Government expenditures in connection with the invasion of Manchuria and North China.

Both wholesale and retail prices have risen considerably since 1932 but are still well below the 1929 level. Money wages have remained fairly stationary since 1932 and are well below the 1929 level. The domestic market has not shown the expansion that might have been expected in view of the recovery in foreign trade. The increased loan expenditure has been an important factor in recovery but much of the expenditure incurred in respect to operations in Manchuria represents foreign investment which cannot in the near future increase the quantity of goods available for consumption in Japan proper. Hence productive activity in Japan has increased faster than consumption. Just as in 1932 Western observers vastly underrated the economic strength of Japan, so in recent times, some of them have tended to view the economic future of Japan with undue optimism.

The following officers were elected for the year 1935–1936: President: Newton M. Sherman, Manager, Division of Analysis and Research, Federal Reserve Bank, San Francisco; Vice-President: M. K. Bennett, Food Research Institute, Stanford University; and Secretary: William A. Sturm, Research Department, California State Chamber of Commerce, San Francisco.

WASHINGTON STATISTICAL SOCIETY.—A dinner meeting was held on November 7, 1935, at the Cosmos Club to discuss the general topic, "How Much Do We Know About Current Industrial Activity and Employment?" Mordecai Ezekiel introduced the three speakers.

The discussion was opened by Mr. Meredith B. Givens. He pointed out the difficulty in the case of production statistics of finding suitable units of physical volume and mentioned the use of related measurements, such as "per cent of capacities," "per cent of full time," "spindle time," "new installation of machinery and equipment," et cetera. Another group of substitute figures related to the consumption of raw materials, such as "cotton consumed," "receipts at markets," et cetera. In the development of composite measures, the movement of the product either in terms of physical units or value units may also be substituted for direct measurement of pro-

duction by securing figures on rate of truck shipments, imports and exports. Data on commodity stocks may likewise be used as a substitute, including measures of "goods in process" and "stocks of finished goods."

In contrast to the statistics of production, employment and pay roll figures involve similar and more homogeneous units. However, there is a wide variability in the quality of the employment data now compiled. There are also important differences in the meaning of the term "employment" as used by the Census Bureau and the Bureau of Labor Statistics. While the evening's discussion was not concerned with wage rates, prices, costs and financial data, it was pointed out that cross section vertical studies of individual industries required the use of statistical data covering each phase of the industrial operation.

The long history of current labor statistics was contrasted with the development of current production data. Whereas labor statistics at one time lagged behind the growth of production data, this relationship has been reversed, especially since the war and today labor data are considerably superior to production data in coverage and in quality. The N.R.A. advanced materially the development of labor statistics, but its effect on production statistics is still rather uncertain, although it is clear that serious difficulties were created by the highly complex classification of industries for code purposes. The Bureau of Labor Statistics has begun the publication of aggregate figures instead of limiting itself to index numbers and has thereby produced a new strain on the reported figures. The Bureau is now making adjustments to census figures previously made by the Federal Reserve Board. It has gone far in improving the coverage of its samples and has increased its coverage of man-hours and non-manufacturing industries. Among the unsolved problems that it faces are the problem of including new firms in current reports, the desirability of securing tabulation by sex to make unnecessary special studies of the employment of women, the classification problem, particularly that of industrial classification, the extension of man-hours reporting, and the problems of Federal-State coöperation which have been rendered more complex by the development of unemployment insurance.

For production statistics, there are two major problems. A clear definition of what is wanted would help greatly in developing these series. Extremely important is the need for the designation of a focal or key agency to assume responsibility for developing current production statistics with adequate equipment and resources to discharge that responsibility. The lack of such an agency has been largely responsible for the unsatisfactory development of this field. This agency should establish contacts with trade groups and pull into the Federal storehouse the statistics which are needed, returning to these groups results which will justify their coöperation.

The next speaker was Mr. Isador Lubin, Commissioner of Labor Statistics, who continued the discussion of current employment statistics. He began by referring to the recent newspaper comparisons of production and employment statistics in which it had been concluded that the United States

would return to the 1929 level of production with considerably less than the 1929 level of employment. He pointed out that the two series were not comparable, first, because they do not cover identical industries, and second, because the employment figures represented the number of workers on pay rolls regardless of the number of hours that they worked. The production indexes are on a different basis and should be compared with man-hours rather than employment.

The Bureau of Labor Statistics covers in its indexes of employment 90 industries, including 85 per cent of the nation's factory workers, and 17 non-manufacturing industries. In the former group there are 74 industries for which the coverage is more than 50 per cent of all persons employed in the industries. In all but six of them the percentage is at least 60 per cent. Only the turpentine industry has less than 30 per cent coverage. This industry has been retained because it represents more than 10 per cent of all factory workers in Florida and Georgia, and an attempt is being made to increase the coverage in preference to dropping the series. These samples are quite representative of the number of persons employed in the industry, but they are biased toward large industries. It is felt that when there are a few large firms that all the firms should be covered. A shut-down, a strike, a fire or other serious disturbances of employment in a single large firm may affect an important fraction of the employment in the industry. It is difficult to secure extensive coverage in industries composed of a large number of very small plants, often with frequent changes of name, location and ownership. Some of these industries, however, were very helpful under the N.R.A. For example, the Bureau received copies of pay rolls from the men's clothing industry for eighteen months.

The immense size of the retail industry, with 1,500,000 establishments, makes it virtually impossible to secure representative coverage. The Bureau is making an attempt to divide the industry into a number of groups or lines tying each in with the manufacturing group with which it is most closely related. The coverage of dyeing and cleaning is being expanded. Banking employment is so stable that semi-annual reports have been regarded as adequate and it is planned to secure them in coöperation with the Treasury and the Federal Reserve Board in connection with their regular reports. In building construction, reports are being received from approximately 10,000 contractors in more than 50 cities, covering some 80,000 workers in private construction. During the last six months, with the coöperation of the Central Statistical Board, the Bureau canvassed 86,000 contractors and more than 20,000 reports have been received, but these have not yet been added to the construction index since it is not known how regularly the reporting will be continued. For all construction financed in part or in whole by federal funds almost complete coverage is achieved, because a clause requiring reporting is written into the contract. At the present time, the Bureau is testing the relative value of construction employment reports based on a one-week basis as compared with a four-week basis.

Comparison of the employment figures with the census data for 1933

showed some biases upward or downward. Many of these discrepancies were found to be due to bad classification of firms in the index. Some were due to the inadequacy of the sample. As a result of social security legislation, it will become possible to secure current employment statistics as a by-product of the collection of funds. The Bureau is now negotiating with one of the states to secure data in this way for the firms that are covered in the Bureau's indexes. The prospect, therefore, is one of decreasing emphasis on the collection of statistics and increasing emphasis on their analysis.

Mr. Woodlief Thomas of the Board of Governors of the Federal Reserve System sketched the development of production statistics from the early activities of the War Industries Board, the Federal Reserve Board, and later the Department of Commerce under Hoover. Early in the development appeared the annual production indexes prepared by the War Industries Board, Walter W. Stewart, E. E. Day, and W. M. Persons, and later the Harvard Economic Service monthly index and the various monthly indexes compiled by the Federal Reserve Board. The current Federal Reserve index has come to be accepted as the standard. There are also a comprehensive biennial index based on the Census of Manufactures and some specially compiled monthly and annual indexes.

One of the uses of the Federal Reserve indexes is to measure the total volume of production; for this purpose the index of manufactures agrees remarkably well with the biennial Census index and the combined index of manufactures and minerals agrees with a special annual index of output of all goods and related services prepared by Simon Kuznets in connection with his study of capital formation. The Federal Reserve index directly represents industries which account for about 40 per cent of the total manufacturing production of the United States and 72 per cent of mineral output. The Census index directly represents about 48 per cent and indirectly represents some 90 per cent of all manufactures. The number of series included in the Federal Reserve index has diminished, however, since it was started. There are also important questions of its representativeness on a monthly basis. For example, ingots produced in one month may represent machines produced several months later. A full test of representativeness is difficult, but some interesting differences appear when the index is compared with indexes of employment based (1) upon a comparable group of industries and (2) upon industries not directly represented in the production index.

A second use of the index is to analyze current changes in production by industries. A break-down of the index by major industrial groups shows differences in their behavior at different points in the depression. Production data may be used in connection with data on sales, stocks, and prices in testing the working of the price system. For these purposes accuracy is especially important.

The Federal Reserve monthly index is now undergoing revision, but there are serious deficiences in available data. Important questions of weighting and adjustment also arise in the preparation of the index.

With regard to available production data, when the Census index was

first compiled, there was a lack of satisfactory data available even on a biennial basis for such important industries as bread and bakery products confectionery and ice cream, women's clothing, machinery and electrical equipment, furniture, printing and publishing, and pottery. In recent censuses physical data for certain of these industries have become available. Biennial data have been available for some time for canning and preserving, paper boxes, paints, manufactured gas, and bricks, but there have been no adequate monthly figures for these industries. Important available monthly information not in the Federal Reserve index include dairy products, rayon, and glass containers. In a number of industries the monthly statistics are not entirely satisfactory. For example, for textile products they are based upon the consumption of raw materials; for paper, tires, and copper the series lack continuity; and for lumber the coverage is small in some regions and changing. Production statistics are especially weak in building materials, chemicals, machinery, and most finished goods. These deficiencies are particularly serious because they occur in industries which show new and rapid developments.

The principal causes of the unsatisfactory character of production statistics are (1) the difficulty of representing and measuring physical production, (2) the haphazard method of collection, which is not based on public need, but rather on the willingness of firms to report, (3) the failure to keep up series after they have been started, (4) the lack of an adequate budget and a principal agency to develop the statistics, and finally (5) the need for a closer relation between use and analysis of production statistics and their collection.

On December 19, 1935, a group meeting was held for the technical discussion of sampling procedures. The discussion was opened by three brief statements—Alexander Sturges, Bureau of Agricultural Economics: "The New York Foods Consumption Survey;" Sidney Wilcox, Bureau of Labor Statistics: "A Weighting Method to Correct for Overexposure of Multi-earner Families;" and Charles Newcomb, Works Progress Administration: "Sampling Procedure in the 1935 Michigan Population and Unemployment Census."

STATISTICAL NEWS AND NOTES

BUREAU OF STATISTICS, INTERSTATE COMMERCE COMMISSION.—The forms used for reporting railway operating statistics to the Interstate Commerce Commission have been given a general revision effective January 1, 1936. The principal changes of statistical interest are the following: Items obtainable from the wheel reports such as ton-miles and car-miles are segregated and are to be reported about one week earlier than heretofore. The separate heading "mixed trains" is abolished, such trains being assigned to the freight or passenger service according to their predominant nature. Gross ton-miles are subdivided according to the nature of the power—coal burning, oil burning, or electric. Suburban train statistics are more completely separated from regular passenger service. The item "train hours" is to be shown for passenger trains as well as for freight. Certain yard service statistics heretofore reported only annually will be shown monthly. Fuel statistics are slightly amplified by adding a separate item for Diesel fuel, gasoline, and electricity in road freight service.

The Interstate Commerce Commission has also adopted a revision of the rules for the separation of operating expenses between freight and passenger services. This is the foundation for all computations purporting to show the cost of performing particular freight or passenger services. The changes made will not affect materially the general results obtained heretofore, but it may be of interest to note that the separation between services has been extended to include operating rentals and taxes. The basis for separating the running track expenses has been changed from cost of fuel consumed by each class of trains to the gross ton-miles of the trains, including the locomotive ton-miles.

The Interstate Commerce Commission also modified its policy with respect to the filing of annual reports. For many years it required a separate report for each active corporation owning or operating a railway in interstate commerce. Recently certain groups of corporations constituting systems have been permitted to file consolidated reports and it is expected that for 1936 such reports will be required where appropriate. This will make the reports more serviceable to students of railway finance.

FEDERAL TRADE COMMISSION.—In its closing days, the last Congress passed the Wheeler Resolution directing the Commission to conduct an inquiry into agricultural income, etc., and to present a preliminary report on January 1, 1936, and a final report by July 1, 1936. The appropriation for the conduct of this inquiry was contained in the Third Deficiency Bill which failed to pass. After some delay, authority was secured from the Budget Bureau by the Commission to use its regular funds for this inquiry and the Commission began its preparation of schedules in accordance with the terms of the Resolution. (Public Resolution No. 61.) On account of pressure to complete the final report on the Power and Gas Inquiry by January 1,

however, only a small staff of about a dozen people were available for this work. The progress made was, in consequence, slow. By the close of the year, however, it was possible to get out schedules to the primary manufacturers of principal agricultural products. The commodities selected for this study were those yielding the farmer a cash income in excess of $200,000,000 in the year 1934. These products were wheat, cattle and calves, hogs, tobacco, cotton, and milk. The schedules in question, in accordance with the terms of the Resolution, called for the investments, profits, and rates of return of the principal manufacturers of these principal farm products from 1928 through 1934; the salaries of the officers and directors of such companies; the growth of their capitalization and assets; percentage of control of the crop and of the manufacturing of such products obtained and maintained by such manufacturers; and detailed data on purchases, sales, etc., designed to be used to answer the inquiry contained in the Resolution as to the proportion of the consumer's dollar obtained by the producers, manufacturers, processors, and distributors of principal farm products. The figures of gross and net income of these companies which are called for, are required for comparison of the changes in the gross and net income of producers of these principal products during recent years.

The Commission sent to Congress early in the present year its Final Report on the Power and Gas Utility Inquiry covering the Natural Gas Industry.

The second Milk Report dealing with the Philadelphia and Connecticut milk sheds was also sent to Congress early in January. This report deals very largely with the operation of the Base Surplus Plan in Connecticut and Philadelphia milk sheds and the differences in the payments to farmers under the two plans. It also contains a detailed analysis of spreads on milk of different classes and the rates of net profit made on various kinds of milk products distributed by the different companies. A chapter is also devoted to the different methods used in the allocation of delivery costs which permit the showing of low or high costs on particular items depending upon how such costs are or have been allocated. Work on distribution costs and other problems of the Milk industry will be resumed in various other sheds early in January.

At the end of the year, the Commission had not finally completed its tabulation of investment, costs, and profits of the textile companies for the first half of the year 1935. Owing to the failure of the funds for this work to pass until towards the close of the last session, it was impossible to get out the textile schedules for the first half year until many weeks after July 1. The new textile schedules covering the last six months of 1935 are expected to go out early in January and it is anticipated that it will be possible to present the reports for the last six months much more promptly than those for the first six months of the year. A limited number of reports covering detailed costs, profits, etc., for the major divisions of the textile industry for the years 1933 and 1934 are available at the Commission's offices.

BUREAU OF FOREIGN AND DOMESTIC COMMERCE.—Annual reports from the offices of Commercial Attachés have been received by the Division of Regional Information. These reports are made so immediately after the close of the year that they do not contain much statistical information. They are in the nature of general economic surveys. While not published by the Bureau for distribution, interested individuals may ordinarily consult copies at District Offices or borrow them from the Division mentioned above.

The Finance Division plans to have its preliminary statement on the "Balance of International Payments of the United States," calendar year 1935, available this month. This Division is also working on a "Handbook on Foreign Currency," which will be completed soon.

The Foreign Trade Statistics Division has published figures on trade with some of the countries with which reciprocal trade agreements were concluded. Their "Summary of United States Trade with World, 1935," calendar year 1935, will be available in a few weeks. Because the value of export statistics is nullified, if the export declarations are not completely, accurately, and promptly made out, mimeographed instructions for exporters and their shipping brokers have been made available for automotive, rubber, and forest products exporters. The pamphlets explain in detail their respective sections of Schedule B, export classification, which is the official United States Government classification of exports. The new revised edition of Schedule B was released in December. Trade Promotion Series, Number 72, "The Shipment of Samples and Advertising Matter Abroad," was brought up-to-date by a revising circular which was released in December. "Advertising in the Union of South Africa" and "Preparing Shipments to Europe," will be available at the time this note is published or a few weeks later.

A 1936 edition of "Sources of Current Trade Statistics" is being prepared. Progress on this source book will be reported in the June JOURNAL. A survey of "Markets for Electric and Gas Facilities in Residential Urban Homes" will be available in a few weeks. Information for this survey has been taken from the data on 64 cities covered in the Real Property Inventory. Studies on the location of certain basic industrial markets have been projected. Such a study for textiles is nearing completion. "The Business Information Service" of the Bureau has been revised and is available to the libraries of accepted Universities and Schools of Business Administration. Among recent monographs presented in this service is one on "How Business Men Have Used the Census of Distribution" and a bibliography on "Coöperative Consumer Societies."

A survey of "The Construction Industry and Its Leading Trade Associations" has been prepared. Total annual dollar volume is shown for the years 1925 to 1935 inclusive. The number of firms, the number of employees and the cost of materials is shown and some 40 government agencies having information of special assistance to the industry are briefly described. About 600 trade associations are listed and a reference list of magazines and textbooks dealing with the industry is appended.

DIVISION OF ECONOMICS AND STATISTICS, FEDERAL HOUSING ADMINISTRATION.—Some of the activities of the Division of Economics and Statistics which were not reported in the last publication of the JOURNAL are summarized in the following paragraphs.

The Division is engaged in developing a technique for analyzing large-scale housing projects with respect to their mortgage risk. The procedure is designed to be of aid to the Administration in connection with the insurance of mortgages on such projects. It will also be useful to any institution which advances money on this type of security.

The technique provides for an estimate of the general economic soundness of the project without reference to a scheme of financing by balancing productivity against the cost of production, thus making it possible to arrive at a justified cost on the basis of predicted earning capacity. The soundnes of the proposed financial plan will be measured by anticipating the total income arising from operations and testing its adequacy in meeting the periodic requirements of expenses and debt service during the term of the loan. Mathematical formulae have been evolved for testing the project under various revenue predictions, as well as under variations of any of the remaining basic elements.

A uniform system of accounts has been prepared for use on all large-scale projects whose mortgages have been insured by the FHA. Forms for a required annual report, and a manual of instructions for their use, have been drawn up for distribution to the managements as soon as operations begin. One project is using this system at the present time.

A complete set of schedules, designed to record the operating experience of multi-family dwellings in a manner comparable to the "Uniform System of Accounts for Low-Cost Housing Projects," has been developed in order to determine trends in expenses and incomes of apartment house projects. A survey of five hundred buildings in nine cities is being undertaken, and data will be obtained for as many years in the past as possible.

A study entitled "Recovery in Construction Activity as Reflected in the Construction Material and Equipment Industries" is in process of publication. It analyzes and appraises available statistics on the volume of construction, the production and shipment of materials, and the status of employment in the construction and material producing industries.

A recently released bulletin entitled "The Report of Bank Loans on Urban Real Estate" presents data on the amount of loans on urban real estate which are held by all commercial banks, and the amount of these loans which conform to the basic requirements for eligibility under Title II of the National Housing Act. The data are presented for National Banks, state member banks of the Federal Reserve System, and other members of the Federal Deposit Insurance Corporation, and by states and Federal Reserve districts.

In order to determine trends in price of residential structures and depreciation or appreciation in their value, the relationship between the original cost and present value of one family dwellings by year acquired is being analyzed

for certain selected cities included in the Financial Survey of Urban Housing. It is planned to extend this technique to all properties on which FHA insured mortgages are issued.

The relationship between rent and income, and the effect of changes in income levels on the rental market, is being studied from data reported in the Financial Survey of Urban Housing and from similar surveys available for West Virginia cities. Preliminary analyses indicate that rents follow very closely Engle's linear expenditure law.

Efforts are being made to determine the size of the sample required to obtain reasonably accurate estimates of the rent and occupancy changes in urban areas. The study is based on a 10 per cent controlled sample survey of occupancy, tenure and rent made in five cities by the Works Progress Administration and the Central Statistical Board in June and July of 1935.

In order to determine losses to be anticipated in long-term amortized mortgages, a technique has been developed for conducting surveys of the mortgage lending experience of financial institutions. Data on 6,697 mortgage loans have been collected from representative financial institutions in four cities and are in the process of being analyzed. The study will be completed shortly.

U. S. BUREAU OF MINES.—In coöperation with the Bureau of the Census, through the Census of Business, the Bureau of Mines will conduct its annual canvass of mineral producers for 1935, employing typical census questions on employment and wages. The questionnaires for individual industries were drafted by the Bureau of Mines and the Bureau of the Census and were reviewed by the Bureau of Labor Statistics and the Central Statistical Board.

Arrangements for use of the regular personnel of the Bureau of Mines in conducting extensive field work have been completed and it is expected that the data on employment and man hours at all mining operations will represent practically complete coverage. Also, complete figures on employment in the crude petroleum and natural gas industry will be collected for the first time since 1919.

BUREAU OF LABOR STATISTICS, U. S. DEPARTMENT OF LABOR.—Work has been started by the Bureau on a survey of prison industries. This survey, undertaken at the request of the Federal Prison Industries, Inc., will show the amount of production in State prisons, the value of goods purchased by various State institutions, and detailed information concerning the work, health, etc., of prisoners.

In coöperation with the National Resources Committee and the Bureau of Home Economics, the Bureau is conducting a nation-wide survey of consumer purchases.[1] This will supplement the study of purchases of the families of wage-earners and lower-salaried clerical workers which was started last year. The new study will cover wider economic groups and communities of

[1] See p. 135.

different size than those covered by the study of wage-earners and clerical workers.

A complete analysis of building permits issued in representative cities for the years 1929 to 1935 inclusive is being made. This study will show, by economic areas within the cities, the number and cost of dwelling houses by cost groups, the number of rooms in dwelling units, and the cubic content of buildings of various types.

The results of the study of administration of workmen's compensation, which has been carried on over a period of several months, are being published in a series of articles in the *Monthly Labor Review*. One article, dealing with the Ontario procedure in the settlement of workmen's compensation claims, appeared in the January 1936 issue, and the second article, on cooperation of workmen's compensation administrations with rehabilitation agencies, was published in the February 1936 issue.

A summary of the results of the survey of wage executions for debt, made jointly by the Bureau of Labor Statistics and the Russell Sage Foundation, also has appeared in recent issues of the *Monthly Labor Review*.

In coöperation with the Works Progress Administration a comprehensive study of reëmployment opportunities and recent changes in industrial techniques has been initiated. The study will seek to develop the results of changed methods of production upon labor productivity and labor employment in certain of the major industries of the country.

Industrial wage studies not previously noted are now under way in the water transportation industry, in the manufacture of paper products (set up and folding paper boxes), and in independent tobacco stemmeries.

UNITED STATES EMPLOYMENT SERVICE.—*Development of Occupational Classification System:* Recent issues of the JOURNAL have contained descriptions of the Inventory of Registered Job Seekers now being established, and of the Occupational Research Program which the Employment Service is conducting. The Inventory of Registered Job Seekers will provide a mechanism for securing periodic detailed analyses of all job seekers registered with the Employment Service as actively in search of employment. Records cover relief employables as well as persons not on relief rolls. Not all registrants actively seeking employment are unemployed as a small proportion of the registrants are employed persons seeking better positions.

The Occupational Research Program has as its objectives:

1. The preparation of occupational descriptions for use by offices of the United States Employment Service to facilitate classification and selection.
2. The investigation and determination of the characteristics of successful workers in various occupations to prepare evaluation, refinement, and development of practical devices for aiding in the selection of qualified candidates for referrals to job openings.

As one objective of the program it is hoped to develop an employment

office technique which will make possible the placement of workers from depressed industries in those of more promise with a minimum loss of experience and training. Through the analysis of jobs and worker skills it may be discovered that apparently unrelated occupations in perhaps widely separated industries require the same general skills and abilities. Thus, it may become possible to place workers in new jobs which have little surface similarity to previous occupations, but to which previously acquired skills and abilities may be advantageously applicable.

Work on the preparation of occupational descriptions has been carried on in several leading industries. Results of these studies are presented in the form of job specifications which give a concise and accurate picture of the various elements of the job as observed by trained analysts working from 12 offices located in urban centers throughout the country. In final form each occupational description contains identifying material in the form of job titles, the industry and department in which the particular job is found, a detailed description of the tasks usually involved in the job, description and explanation of machines, tools and materials used by the worker, the employment qualifications of the worker usually required by employers, a general description of the working conditions on the job, the relation of the job covered to other jobs in the same industry and special information of assistance in selecting properly qualified applicants. Publication is undertaken on an industrial basis, one or more volumes being issued for each separate industry covered. Volumes have been prepared covering the cotton, textile, laundry, automobile and automobile body manufacturing, and construction industries. The study of the construction industry includes five volumes. Job descriptions for hotels, restaurants, retail selling, lumber and mills, and the foundry and machine shop industries are now in process of preparation.

Of direct interest to statisticians is the system of occupational classification developed in connection with the statistical reporting system of the Employment Service. This occupational grouping was prepared after an analysis of existing occupational systems used in governmental agencies and organized labor and industrial groups.

The chief purpose of the new classification is to describe the occupational character of the unemployed registered with the offices of the United States Employment Service. The system, however, is broadly inclusive and is believed to be adaptable to use in other fields.

Briefly, the classification system consists of eight major groups each made up of a series of jobs which seem to have occupational homogeneity. The grouping of occupations is designed to eliminate industrial stratification as far as possible so as to serve as a basis for indicating the degree of mobility of certain occupations across industrial lines. The sub-groups in each main occupational group represent further breakdowns characterizing the occupations within the group.

A five digit numerical code is used in connection with this classification system, the first digit indicating the major group and the second digit the sub-group in which any particular occupation is a part.

Approximately 9,000 individual job titles are included in the classification system. In the case of alternate job titles referring to a single occupation only one classification is adopted, other titles referring to the same job being indicated by a cross index.

A list of the eight major groups and their sub-groups follows:

OCCUPATIONAL GROUPS

I. Professional and Kindred Workers
   1. Professional Workers
   2. Semi-professional Workers
   3. Technicians
   4. Administrators and Supervisory Workers

II. Salespersons
   1. Inside
   2. Outside
   3. Related Service

III. Clerical Workers
   1. Machine
   2. Non-machine

IV. Service Workers
   1. Domestic
   2. Personal (Outside and institutional)
   3. Maintenance

V. Craftsmen and Skilled Workers

VI. Production Workers (semi-skilled)
   1. Predominantly Machine
   2. Predominantly Manual

VII. Physical Labor Workers (unskilled)
   1. Heavy
   2. Light

VIII. Unassigned Persons

BUREAU OF AGRICULTURAL ECONOMICS.—The Bureau of Agricultural Economics is serving as joint sponsor with the Works Progress Administration in conducting a nation-wide statistical project utilizing "white collar" relief workers. The project contemplates the gathering, from the official records in 1,000 agricultural counties, of data pertaining to farm mortgages filed and released and farm mortgage foreclosures, covering the period 1917–1935. A sample record of farm taxes levied will be obtained for the period 1890–1913. In a smaller number of counties, data will be obtained on farm real-estate transfers to supplement and expand data obtained under a C.W.A. project in 1934.

In carrying out the technical supervision of this project the Bureau will have the active coöperation of most of the State agricultural experiment stations who are designating members of their staffs to aid in setting up and supervising the projects within their respective States. Headquarters for the project will be established at Chicago where the tabulation of the field data will be conducted.

A summary of the food situation and the supply of foods available for domestic consumption during 1935–36, with comparative data for 1933–34, 1934–35 and the 1925–29 average, was released on October 31, 1935.

FARM CREDIT ADMINISTRATION.—The Division of Finance and Research in the Washington office of the Farm Credit Administration, headed by Dr. F. F. Hill of Ithaca, New York, includes a financial analysis and statistical section and an economics subdivision which has general supervision over the work of a statistical unit in each of the twelve Farm Credit Administration district offices. The financial analysis and statistical section, under the direction of Mr. D. C. Carnes, is responsible for the collection, compilation, review and analysis of the primary statistical data regularly reported by the institutions under the jurisdiction of the Farm Credit Administration, covering their operations and financial condition. These data include periodic information on applications received, loans closed and outstanding, collections and delinquencies, foreclosures and real estate operations, income and expense items, investment portfolios, securities issued and outstanding, and balance sheet items, for institutions extending both long-term and short-term credit to farmers and farmers' organizations. Together these data constitute a current record of developments in an important sector of the farm credit field.

A program of research studies having a direct bearing upon the formulation of lending policies and the solution of operating problems of the Farm Credit Administration is now being initiated by the economics subdivision of the Division of Finance and Research under the direction of Dr. W. G. Murray, who is on leave of absence from Iowa State College. Projects now being carried on include special studies of credit problems in selected areas, various studies based wholly or largely upon the statistical data collected through the operating units of the organization, an analytical appraisal of the principal foreign farm mortgage credit systems, a study of new recordings of farm mortgages as shown by county records, and periodic current analyses of factors in the general business and agricultural situation having particular bearing upon the operations of the Farm Credit Administration. The development of the entire research program is directed toward improvement of the lending policies, institutional set-up, and operations of the organization and toward critical appraisal of the relationship of the Government to the system.

In addition to the research program being developed in the Division of Finance and Research, the research, service and educational section of the Coöperative Division of the Farm Credit Administration conducts research studies dealing primarily with the organization, operation and financial policies and problems of farmers' coöperative marketing and purchasing associations. Typical studies now being made by the section include an analysis of the financial organization and membership problems of Iowa Coöperative Creameries, an analysis of the merchandising policies of the California Walnut Growers' Association, and an analysis of the coöperative cotton ginning industry in Oklahoma and Texas. All studies are pointed directly to the solution of current practical problems of coöperative associations, such as management, operating methods, financing and merchandising practices, sales policies, costs, transportation, membership relations and

contacts, competitive factors and possibilities for coöperative organization in specific commodities or areas.

BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM.—The Division of Research and Statistics of the Board of Governors of the Federal Reserve System, with the assistance of the Federal Reserve banks, is undertaking the supervision of a Works Progress Administration Project on the distribution and activity of the deposits of a number of banks in the period 1928–1933. These banks, now in receivership, number about 140. The main purposes of the study are to supplement existing information on the variations in the deposit balances of different economic classes in different phases of business activity, to analyze the type and character of drains which these banks experienced prior to suspension, to throw some light on the relation of deposit balances to credits to personal deposit holders' accounts, and to provide information on the relation of borrowers' deposits to their borrowings.

U. S. PUBLIC HEALTH SERVICE.—The health inventory which was described in this JOURNAL (December, 1935, p. 746) is now being carried on in every one of the 95 cities, employing a total of 3,517 persons, 3,194 of which are from the relief rolls. The survey is being conducted from a field central office in Detroit, Michigan, where the coding and punching of the data will also be done. The health survey is under the direction of Assistant Surgeon General L. R. Thompson, in charge of the Scientific Research Division, with G. St. J. Perrott acting as project director and Clark Tibbitts as field director with headquarters in Detroit.

With reference to the permanent activities of the Public Health Service, Dr. William Gafafer of the Johns Hopkins School of Hygiene and Public Health has recently been appointed Senior Statistician to be in charge of the statistical work of the Office of Child Hygiene.

DIVISION OF VITAL STATISTICS, BUREAU OF THE CENSUS.—The Division of Vital Statistics, Bureau of the Census, issues two annual volumes—*Mortality Statistics* and *Birth, Stillbirth and Infant Mortality Statistics*. In addition to these annual volumes, it has been the practice to prepare a number of special studies upon subjects in which public interest was manifest. These studies have been released to interested individuals.

It is the desire of the Division to amplify the variety and number of such studies in the future and to make them available to the public. To achieve this end, the Division is inaugurating a new series, which will be entitled *Vital Statistics—Special Reports*. Each report will be identified in the series. The page numbering will be consecutive throughout the year. At the end of the year a table of contents and cross-index will be prepared as a part of the series so that the special reports may be bound and preserved.

Very few of the reports in this series will be provisional or preliminary in character. They will provide the latest available data on mortality, natality, and stillbirths. They will include information and studies upon

topics in demand by the public, the press, the state and city health officers, the registrars, as well as scientific statistical groups. Although some of the *Special Reports* will appear later in the regular annual volumes, in most instances the data and the analyses will be published only in this series. The scope of the reports will cover trend analyses over a period of years, intercomparisons between states and cities, special data on important or unusual causes of death, on multiple causes of death, or on births, new tabulations on residence, and a variety of analytical studies and discussions of important problems in the field of vital statistics.

In order to ensure the widespread availability of *Vital Statistics—Special Reports*, the new series will be mailed to a list of depository libraries which have agreed to preserve them. They will be sent to the office of each registrar of vital statistics in states and large cities where it is hoped they will be filed and preserved for reference. They will be sent to a small select list of foundations, schools, and statistical agencies particularly interested in using vital statistical data and will be made available to the public press.

The Division of Vital Statistics is publishing a new paper entitled *The Registrar*. It was released for the first time on January 15, 1936, and will be issued periodically thereafter on the fifteenth of each month. The publication of this paper is intended to fill the need for a dependable method of communication between the registrars of the country. Each state and city registrar should know the problems which face the registrars of other states and cities. He should receive current news of happenings in Washington, which might concern his interests. It is expected that he will contribute items of interest, news, problems, and statistics from his locality. It is hoped that the paper will become a useful link in correlating registration activities in Vital Statistics.

WOMEN'S BUREAU, U. S. DEPARTMENT OF LABOR.—Recently completed by the Women's Bureau is a study made at the request of the Commissioner of Labor of Texas of the hours, wages, and working conditions of women in Texas industries. A total of 369 establishments in 43 cities and towns were covered, including factories, stores, laundries, hotels and restaurants, and telephone exchanges. Important data also were obtained on industrial home work; the type of work covered was the making of infants' and children's garments, and handkerchiefs, and the shelling of pecans. Wage data for 15,343 women were copied from pay roll records for a week as near the middle of February 1932, as possible, and whenever they were available similar records for a week in 1931. Records of time worked during the week whether reported in hours or days were obtained where possible. Results of the investigation of working conditions in the establishments visited and information concerning the workers as to age, nativity, marital status, and length of service with the firm also are presented in the survey. Manufacturing plants made up 37 per cent of the establishments visited and employed over half of the workers for whom wage data were obtained. Statistical data were tabulated by racial groups—2 of every 11 women included in the survey were Mexicans, and about 1 in every 11, Negroes.

On the whole, the study shows long hours and low wages prevailing in the State. While 85 per cent of women telephone operators had a weekly schedule of 48 hours, a scheduled week of more than 50 hours was reported for over half the women in factories, stores, and laundries, about 30 per cent of the total having a week of at least 54 hours. Of all women, 20.9 per cent earned less than $5 a week and 67.5 per cent earned less than $10. Only 10.6 per cent earned as much as $15 for their week's work, and 28.2 per cent of these were telephone operators. In practically all cases the proportions earning $15 or more a week were much larger in 1931 than in 1932.

A summary of employment standards which will insure the health and safety of women in industry has just been published by the Women's Bureau. "To formulate standards and policies which shall promote the welfare of wage-earning women, improve their working conditions, increase their efficiency, and advance their opportunities for profitable employment," are the duties of the Women's Bureau as outlined in the Act of Congress creating it. Through its 18 years of existence, the Bureau has attempted to establish adequate employment standards on the basis of scientific investigation. The present summary brings together its findings and constitutes a valuable handbook to employer or employee. Among the standards discussed are those for wages; hours; working conditions, such as lighting, ventilation, cleanliness, noise, vibration, seating, and fire protection; the provision of personal service facilities such as drinking, washing, and toilet facilities and dressing, rest, and lunch rooms; and industrial accidents and disease.

OHIO COLLEGE ASSOCIATION.—The Committee on Entrance of the Ohio College Association has prepared a four-page uniform college information blank to be filled out by senior students in Ohio high schools. This form has been filled out by 40,000 senior students. From the resulting punched Hollerith cards it will be possible to give each Ohio college separate packs of duplicated cards (with the data typewritten as well as punched on the card) for all pupils specifying the college as first, second or third choice. Mimeographed lists will be available showing (1) pupils of promise needing scholarships and (2) pupils of promise who are undecided as to college attendance, with additional information about those pupils who meet the college's specifications as to the "ideal type" of student. It will also be possible to study intensively the problem of educational opportunity in Ohio as dependent upon such factors as race, sex, father's occupation and intelligence.

OFFICE OF EDUCATION.—Tabulations have been completed for "Statistics of State school systems, 1933–34," and copies of all the tables are on file in this office. The same is true of "Statistics of city school systems, 1933–34," except that copies are kept for the first five summary tables only. These studies have gone to the Government Printing Office. "Per capita costs in city school systems, 1934–35," is completed. Photostat copies of the tables are available for loan while the study is being printed. Tabulations are progressing on "Statistics of public high schools, 1933–34," and "Statistics

of higher education, 1933–34." Total figures are not yet available. A study is in progress for certain general and financial items for a sampling of rural county school systems compared with urban, city, school systems and rural-urban county unit school systems.

DIVISION OF RESEARCH, STATISTICS, AND RECORDS, WORKS PROGRESS ADMINISTRATION.—On November 22, 1935, a new division of Research, Statistics, and Records was authorized by Mr. Gill under the direction of Emerson Ross. This includes the old Division of Reports, Statistics, and Records and the Division of Research and Planning of the Works Progress Administration and such Federal Emergency Relief Administration statistical and economic activities as may be continued. On the same date Howard B. Myers was authorized to continue the activities previously carried on under his direction under the new title of the Division of Social Research of the Works Progress Administration.

Although the Federal Emergency Relief Administration has ceased to grant funds to the States for relief purposes, the Division of Research, Statistics and Records is planning to continue to obtain basic statistical information concerning the number of persons and cases receiving general relief financed with public funds and amounts of obligations incurred, by sources of funds.

Various studies are being undertaken in an effort to preserve statistical and descriptive summaries of the numerous activities and programs of the Federal Emergency Relief Administration now being discontinued. Several have appeared in recent issues of the *Monthly Report of the Federal Emergency Relief Administration* while others are in preparation for subsequent issues.

One group of such summaries covers the financing of emergency relief. An analysis of State financing of relief followed by a survey of State borrowing for relief purposes has appeared (July and August Monthly Reports). A review of State relief financing through the sales tax is completed, while other phases of State relief financing are in process of summarization for publication.

A statistical and descriptive summary of the production-for-use activities of the Emergency Work Relief Program has been published. Likewise, another article summarizes the activities of the former Federal Surplus Relief Corporation, an organization created to make available to persons on relief some of the surplus agricultural commodities. A survey of the operations of the rural rehabilitation program prior to its recent transfer to the Resettlement Administration has also been completed. The results of an analysis of the relationship between estimates of unemployment and the relief data will appear shortly. A final summary of the Civil Works Program is being undertaken and an intensive analysis of work relief has just recently been initiated.

DIVISION OF SOCIAL RESEARCH, WORKS PROGRESS ADMINISTRATION.—Materials of the March Labor Inventory are being prepared for publication as

a "Census of Usual Occupations of Workers on Relief, March 1935." The tables classifying workers on relief by age, type of usual occupation, place of residence, color and sex, have been completed for the United States and for each State and will be included in the census volume. A second complete count, giving usual occupations and employment status of relief workers certified as eligible for Works Program employment, is being taken on January 15, 1935; data will be made available for the United States, each State, and the Districts of the W.P.A.; county information will also be on file. Plans are completed for a special sample study of the educational attainments of workers on relief in March 1935, to supplement the census volume referred to above. Data will be prepared to show educational attainment by occupation, and by age, for urban, rural, color and sex classifications of workers.

With the withdrawal of the Federal Government from relief activities, the thirteen city *Study of Current Changes in the Urban Relief Population* is to be discontinued. It will be replaced by a *Study of Trends in the Economic Status of Former Urban Relief Cases* (to be conducted in the same thirteen cities) which will undertake to follow through a period of time a group of identical families during and subsequent to their period on relief. It is aimed to examine the transitional process by which families move from relief to care by other agencies or to a position of self-sufficiency in private employment. From five to seven thousand families will be included in the sample studied. Information is to be obtained on adequacy and effectiveness of relief measures administered through state and city boards; effectiveness of the Works Program in providing means of support; relative employment opportunities provided by individual industries and the shift from one industry to another; the shift from one occupational group to another; the amount of shift of the needy cases from one agency or program to another; and the effects of these shifts upon the cases involved.

The *Rural Current Change Survey* consists of several studies conducted in a carefully selected sample of 331 counties in 33 States: (a) cross-section surveys made in February, June, and October 1935, and (b) analyses of cases coming on and going off the relief rolls made for the intervening months; these two aspects of the survey will be discontinued after the December 1935 report and will be replaced by (c) a new study of the post-relief status of rural relief cases closed after June 1935, covering approximately 7,000 families in seven States; (d) an analysis has been made of the industries supplying the employment which was responsible for the closing of 277,000 rural relief cases from March through June 1935.

Two bulletins have been issued on changes in the rural relief load, "The Trend of Rural Relief" and "Changes in the Rural Relief Population Through October 1935." A comprehensive report is being prepared on farmers on relief and rehabilitation; the analysis will include such topics as mobility, family composition, occupational shifts, and bases for selection of rural rehabilitation clients.

Reports are now being prepared upon three rural sample surveys made in

1935. The first was a *Study of Farm Rehabilitation Problems* in the drought area of the West. The second was an examination of the possibilities for rehabilitating *Rural Relief Families in Combined Farming-Industrial Employment;* this study brings together pertinent data from secondary sources and has been supplemented by an extensive field survey covering seven counties in the Eastern Cotton Area. The third is a *Study of the Plantation-Tenant Situation in the South* and its implications for the administration of rural relief and rehabilitation programs.

Surveys of Transients. The analysis of a study of migrant family groups is making available for the first time a detailed description of this mobile relief population. The study is based upon a representative sample of family groups receiving care from transient bureaus in 85 cities throughout the U.S. The first of a series of bulletins derived from this study has been issued; it is concerned with the composition, size, and the employability of the economic head of migrant family groups.

The final report on the study of transient service bureau cases has been completed and sent to the printer. This report will appear in research monograph form under the title of "The Transient Unemployed."

A general descriptive bulletin entitled "On Relief" has been widely distributed; it includes 21 pictograph charts describing various aspects of the relief problem. A similar bulletin is now being prepared relating to relief and non-relief youth.

A bulletin containing estimates on the number of youth on relief in May 1935 has been released, giving information on urban and rural youth by age, sex, and race, and youth being cared for under transient and C.C.C. programs.

Research Monograph I—"Six Rural Problem Areas: Relief, Resources, Rehabilitation" has been given wide distribution.

COÖRDINATING COMMITTEE OF THE CENTRAL STATISTICAL BOARD AND THE WORKS PROGRESS ADMINISTRATION.—On November 22, 1935, Charles F. Beach was appointed Chairman, vice Stuart A. Rice resigned. During the six months period of operation ending January, a total of 3,147 statistical, survey, and research projects, calling for expenditures of more than $320,000,000, were received. In addition to the statistical projects, the Committee examined between 900 and 1,000 projects which it ruled non-statistical. Final action has been taken on more than 2,500 of the statistical projects. Approximately three-fourths of those reviewed have been disapproved because of duplication of subject matter, of respondents or both, or because of technical inadequacy, or because they were not administratively feasible. The current inspection and advisory service to sponsors of approved projects is being maintained through the use of State Statistical Coördinators, Regional Research Supervisors, and the Washington field staff.

CENTRAL STATISTICAL BOARD.—A *Directory of Federal Statistical Agencies* has been prepared to supersede the Directory of Statisticians of the United

States Government published by the Central Statistical Board in January 1935.

UNIVERSITY OF OXFORD.—An Institute of Statistics has been established at Oxford under the direction of Mr. J. Marschak. The Institute will attempt, in coöperation with other University institutions, to promote social research on its empirical and quantitative side. It will therefore assist persons doing social research work in Oxford (senior members as well as students): (a) by building up a library which will comprise books, periodicals, and a collection of documents; (b) by preparing and keeping continually up to date detailed lists of sources relevant to the specific subjects under research; and by providing sources not yet available in Oxford; (c) by discussing and executing jointly with the individual researchers such work of statistical estimation and computation as is required for the completion of the empirical and quantitative side of the research in hand.

It is hoped that this assistance and these advisory activities will also substantially help to coördinate work done by individual researchers, and encourage economists to strengthen the empirical and quantitative side of their work.

Members of the sub-Faculty of Economics have expressed, on various occasions, the wish to coöperate, especially in the field of Economic "Dynamics" (Trends and Cycles). No centralized investigation according to a rigid programme can, however, be promised for the early years of the existence of the Institute, until such time as a group of younger researchers has been trained for and interested in empirical work; and until funds (after the completion of the greater part of the capital equipment) can be made available for the payment of a full-time research staff. The theoretical interests which prevail at present among the senior researchers in Oxford do not permit of a strict organization. But it is thought that the statistical and empirical side of their work may be materially aided, and team work fostered, on the lines described in the first paragraph.

It would therefore be a mistake to compare the activities of the Institute, at the beginning, with the centralized work which is being done by the full-time staff of such organizations as the Oxford Agricultural Economics Research Institute; the National Bureau of Economic Research, in New York; the Brookings Institution, in Washington; the Institut für Weltwirtschaft, Kiel; etc.

The teaching of Statistics as applied to the Social Sciences requires a much more extensive and more easily accessible supply of sources than has hitherto been available in Oxford. It is hoped that the Institute will help to develop the knowledge of sources and the skill in using them and to prepare future investigators.

UNIVERSITY OF PARIS.—Dr. Jerzy Neyman delivered in January, 1936, a series of six lectures at the Henri Poincaré Institute on "Problems of Statistical Estimation and the Verification of Hypotheses."

AMERICAN MATHEMATICAL SOCIETY.—A symposium on mathematical statistics will be held at Columbia University on April 11, 1936 by the American Mathematical Society. In addition to short papers and discussion the program will include the following four addresses: "Methods of Obtaining Probability Distributions," by Burton H. Camp; "The Method of Maximum Likelihood," by Harold Hotelling; "The Characterization of a Distribution Function Through Its Moments," by J. Shohat; and a paper by S. S. Wilks.

PERSONAL NOTES

Mr. Wilbert G. Fritz, Financial Economist of the Bureau of Business Research, University of Pittsburgh, has been granted a leave of absence for the coming year to continue his studies at Columbia University, where he has been awarded a University Fellowship for work in statistics and economics.

Mr. Theodore A. Veenstra, Statistician of the Bureau of Business Research, University of Pittsburgh, has returned to his work after a year's leave of absence, during which he was first with the State Emergency Relief Board at Harrisburg and later with the Federal Housing Administration in Washington.

Dr. Horatio M. Pollock, Dr. Benjamin Malzberg and Mr. Raymond G. Fuller are making a comprehensive study of heredity and environmental factors in the causation of dementia praecox and manic-depressive psychoses. The study deals with original material collected by field studies made possible by a grant from the Laura Spelman Fund. Installments of the study have been appearing in the *Psychiatric Quarterly*. When complete, they will be brought together and published in book form.

NEW MEMBERS

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McClure, Howard H., Director, Division of Current Business Statistics, Central Statistical Board, 7834 Commerce Building, Washington, D. C.

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Nelson, W. Linton, Treasurer, The Investment Corporation of Philadelphia, 225 South 15th Street, Philadelphia, Pennsylvania

Neufeld, Milton, Financial Statistician, Emergency Relief Bureau, City of New York, 902 Broadway, New York City

Neyman, Dr. Jerzy, Reader, Department of Applied Statistics, University College, London, W. C. I., England

Osborn, Frederick, Research Associate in Anthropology, American Museum of Natural History, 52 Broadway, New York City

Ozer, Dr. Sol D., Chief, Section on Procedures, Finance and Statistics, Division of Professional and Service Projects, Works Progress Administration, Washington, D. C.

Parrott, D'Arcy, Investment Analyst, Messrs. Fahnestock & Company, 1 Wall Street, New York City

Patton, Archibald, A., Statistician, Associated Press, 383 Madison Avenue New York City

Peyton, William E., 2836 Meade Avenue, San Diego, California

Phelps, Dr. D. M., Assistant Professor, Tappan Hall, University of Michigan, Ann Arbor, Michigan

Randall, Alexander B., Technical Adviser, State Housing Authority of New Jersey, 1060 Broad Street, Newark, New Jersey

Reed, Dr. Harold L., Professor of Economics, Cornell University, Ithaca, New York

Ring, Jacob, 229 East 7th Street, New York City

Royer, Dr. Elmer B., Director of Admissions, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma

Candelet, John E., Statistician, Industrial Trust Company, 111 Westminster Street, Providence, Rhode Island

Carothers, Doris, Associate Research Supervisor, Division of Research, Statistics and Finance, Federal Emergency Relief Administration, Washington, D. C.

Cella, Raymond, Statistical Clerk, Agricultural Adjustment Administration, Lexington, Kentucky

Chapman, Dr. Dwight W., Jr., Instructor and Tutor in Psychology, Harvard University, Cambridge, Massachusetts

Cornatieanu, Dr. Nicolae, Professor, Department of Agricultural Economics, Cornell University, Ithaca, New York

Cornell, Francis G., Research Assistant in School Administration, Teachers College, Columbia University, New York City

Cornell, Merriss, Instructor, School of Social Administration, Commerce College, Ohio State University, Columbus, Ohio

Cross, Erminie J., Statistical Secretary, Division of Health Studies, The Commonwealth Fund, 41 East 57th Street, New York City

Eakin, F., Comptroller, A. E. Staley Manufacturing Company, Decatur, Illinois

Eder, George J., Manager, Foreign Securities Department, Standard Statistics Company, Inc., 345 Hudson Street, New York City

Ellickson, J. C., Associate Analyst, Resettlement Administration, 1025 Vermont Avenue, Washington, D. C.

Ellis, Dr. R. K., Assistant Professor, Iowa Wesleyan College, Mt. Pleasant, Iowa

Feuerlein, Willy, P. O. Box 2679, Yale University, New Haven, Connecticut

Foster, Le Baron R., Associate Director, Pollak Foundation for Economic Research, 109 Sargent Street, Newton, Massachusetts

Fouch, George E., Assistant Professor, Department of Business Administration, Wittenberg College, Springfield, Ohio

Franzen, Dr. Raymond, President, National Markets Analysis, Inc., 155 East 44th Street, New York City

Freeman, N. L., Chief Inspector, Westinghouse Electric and Manufacturing Company, Box 606, Newark, New Jersey

Fridinger, Arthur B., Associate Statistician, National Recovery Administration, Washington, D. C.

Gooch, Dr. Marjorie, Assistant Statistician, New York State Department of Health, Division of Communicable Diseases, Albany, New York

Goor, Charles G., Junior Statistician, The Railroad Retirement Board, Tower Building, Washington, D. C.

Goudriaan, Dr. Ir. J., Sub-manager, N. V. Philips' Glowlamp Works, Eindhoven, Holland

Greig, Gertrud, Statistician, Works Progress Administration, Washington, D. C.

Grubb, Kenneth A., Manager and Director of Field Research, Daniel Starch and Staff, 42 Quincy Street, Cambridge, Massachusetts

Hadley, Clausin, D., University Club, Madison, Wisconsin

Haenszel, William M., Statistician, New York State Department of Health, 65 Court Street, Buffalo, New York

Harold, Miriam S., Member of Technical Staff, Bell Telephone Laboratories, 463 West Street, New York City

Hutchings, Paul R., Chief, Reëmployment Unit, Labor Studies Section, National Recovery Administration, 4217 Commerce Building, Washington, D. C.

Kennedy, Stephen J., Director of Research, Pacific Mills, 214 Church Street, New York City

Kessler, Edith L., 255 West 108th Street, New York City

Kiernan, Charles J., Associate Professor of Economics, School of Commerce, St. John's University, Brooklyn, New York

Knight, Dr. C. Louis, Economic Analyst, Federal Home Loan Bank Board, Division of Research and Statistics, 1006 HOLC Building, Washington, D. C.

Knowles, Nathaniel, Jr., Statistician, Reed A. Morgan & Company, Commercial Trust Building, Philadelphia, Pennsylvania

Lamon, Russell, Investment Supervisor, Edie-Davidson, Inc., 1506–1512 Lincoln Liberty Building, Philadelphia, Pennsylvania

Lehner, Joseph, Retail Merchandising, R. H. Macy and Company, Inc., 34th Street and Broadway, New York City

Lehtinen, Arthur, Assistant Director, Bureau of the Economic Defense Council, Cornell University, Ithaca, New York

Lerner, E. R., Research Assistant, Central Statistical Board, 7028 Commerce Building, Washington, D. C.

Linder, Dr. Forrest E., Bureau of the Census, Division of Vital Statistics, Washington, D. C.

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Schwartz, Saya S., Administrative Assistant for Research and Statistics, Philadelphia County Relief Board, 112 North Broad Street, Philadelphia, Pennsylvania

Seiger, Benjamin M., Associate Chief, Records-Reports-Statistics Section, Division of Project Control, Works Progress Administration, Washington, D. C.

Shearon, Dr. Marjorie, Senior Analyst, Division of Research and Statistics, Works Progress Administration, Washington, D. C.

Shmied, Ernest A., 2801 Park Avenue, Minneapolis, Minnesota

Shreiner, John F., Statistician and Investment Analyst, Wm. J. Mericka & Company, 1836 Union Trust Building, Cleveland, Ohio

Silliman, Betty F., Inter-Ocean Reinsurance Company, Post Office Drawer #31, Cedar Rapids, Iowa

Smith, Dorothy E., Statistical Clerk, National Recovery Administration, La Salle Building, Washington, D. C.

Steinbach, Milton, Partner, Wertheim & Company, 120 Broadway, New York City

Taylor, Burton W., Instructor, Department of Sociology, Syracuse University, Syracuse, New York

Torrance, Charles M., Principal Clerk, Division of Research and Statistics, Federal Home Loan Bank Board, Washington, D. C.

Toteff, Anastas U., Graduate Student, Cornell University, Ithaca, New York

Varley, Dimitry V., Statistician, New York State Employment Service of the New York State Department of Labor, 124 East 28th Street, New York City

Webster, Lawrence P., 1571 Taylor Avenue, New York City

Williamson, W. Rulon, Assistant Actuary, Life Actuarial Department, The Travelers Insurance Company, 700 Main Street, Hartford, Connecticut

Wing, George J., 414 Summit Avenue, Oconomowoc, Wisconsin

Woytinsky, Wladimir S., Member of Staff and Consultant for Social Security, Central Statistical Board, 7024 Commerce Building, Washington, D. C.

Yerushalmy, Dr. Jacob, Statistician, State Department of Health, Albany, New York

Zwickl, Oscar, Assistant Engineer, Valuation Department, Lehigh and New England Railroad Company, 642 Main Street, Bethlehem, Pennsylvania

Proceedings of the Ninety-Seventh Annual Meeting

COMMODORE HOTEL, NEW YORK CITY

Program

FRIDAY, DECEMBER 27, 1935

10:00 A.M.—I. The New Deal and the Investor

Chairman: Roland P. Falkner, National Industrial Conference Board

Speakers: Bernhard Ostrolenk, City College, New York
John T. Madden, New York University

Discussant: Dean Langmuir, Dean Langmuir, Inc., New York City

The Foundations of American Wealth and Industrial Supremacy

Speaker: Carl Snyder, New York City

Discussant: W. W. Cumberland, Wellington & Co., New York City

10:00 A.M.—II. Evaluation of Research Work Done Under the Emergency Relief Programs

Joint Session with American Sociological Society

Chairman: R. Clyde White, Indiana University

Administering Relief Through Research Work
Howard B. Myers, Federal Emergency Relief Administration

Significant Developments in Social Research under the FERA
C. Horace Hamilton, North Carolina State College

The Coördinating Committee of the Central Statistical Board and the Works Progress Administration
Charles Beach, Works Progress Administration

Discussant: R. W. Murchie, University of Minnesota

10:00 A.M.—III. Recent Developments in Collection of Industrial Statistics

Chairman: Aryness Joy, Central Statistical Board

N.R.A.'s Statistical Experience
Theodore J. Kreps, Stanford University

Wanted: New Industrial Statistics
Willard Thorp, Dun & Bradstreet

Post-N.R.A. Machinery for Collection of Industrial Statistics
Stephen DuBrul, General Motors Corporation

The Central Statistical Board's Program for Industrial Statistics
Howard McClure, Central Statistical Board

10:00 A.M.—IV. Round Table on Statistics of Marketing

Chairman: Roland S. Vaile, University of Minnesota

The New Retail Price Indexes of the Bureau of Labor Statistics
Stella Stewart, U. S. Department of Labor

Size of Samples in Marketing Surveys
Theodore H. Brown, Harvard University

Retail Price Dispersion
John H. Cover, University of Chicago

FRIDAY, DECEMBER 27, 1935

12:30 P.M.—LUNCHEON MEETING

Committee on Census Enumeration Areas

Chairman: Howard W. Green, Cleveland Health Council

12:30 P.M.—LUNCHEON MEETING

Joint Session with Committee on Economic Accord

Chairman: Fred R. Fairchild, Yale University

The Need for Economic Accord
W. Randolph Burgess, Federal Reserve Bank of New York

The Mechanics of Ascertaining What Economists Believe
Earl E. Muntz, New York University

Accomplishments in Economic Accord
William H. Kiekhofer, University of Wisconsin

3:00 P.M.—I. THE NATURE OF THE BUSINESS CYCLE

Chairman: Wesley C. Mitchell, Columbia University

The Shape of the Business Cycle Curve
Charles E. Armstrong, New York Telephone Co.

Fluctuating Credit Volume and the Business Cycle
Frederick R. Ottman, New York University

Credit Buying as a Cause of the 1929 Crash
Lyman S. Logan, Economics Statistics, New York City

Discussion: Harold V. Roelse, Federal Reserve Bank of New York
Otto Nathan, New York University

3:00 P.M.—II. THE RECOVERY PROGRAM AND AGRICULTURE

Joint Session with American Farm Economic Association

Chairman: Willford I. King, New York University

The Agricultural Adjustment Act and National Recovery
Chester C. Davis, Agricultural Adjustment Administration

Fundamental Significance of the Agricultural Adjustment Concept
E. G. Nourse, Brookings Institution

Discussion: J. D. Black, Harvard University
J. I. Falconer, Ohio State University

3:00 P.M.—III. THE BIRTH RATE OF THE POPULATION ON RELIEF

Chairman: Robert E. Chaddock Columbia University

The Measurement of the Rate and of the Effect of Relief
Frank W. Notestein, Milbank Memorial Fund

Should Relief Recipients Eschew Parenthood?
Mary Ross, Associate Editor, *The Survey*

Discussion: Henry Pratt Fairchild, New York University
Samuel A. Stouffer, University of Chicago

6:30 P.M.—DINNER MEETING—UNEMPLOYMENT, RELIEF, THE UNBALANCED BUDGET, AND INFLATION

Chairman: J. Franklin Ebersole, Harvard University

Speakers: Luther A. Harr, Commonwealth of Pennsylvania
Robert M. Haig, Columbia University
John C. Gebhart, National Economy League

Discussion: Norman Lombard, Economic Consultant
Ralph Robey, Columbia University

SATURDAY, DECEMBER 28, 1935

9:00 A.M.—BUSINESS MEETING

10:00 A.M.—I. THE A.A.A.

Chairman: Benjamin H. Hibbard, University of Wisconsin

The A.A.A. and the Consumers
Calvin B. Hoover, Duke University

The A.A.A., the Cotton Growers, and the Ranchmen
Alonzo B. Cox, University of Texas

The A.A.A. and the Tenant Farmers
Norman Thomas, Socialist Party Leader

Discussant: Louis H. Bean, U. S. Department of Agriculture

10:00 A.M.—II. ECONOMIC HISTORY

Chairman: John R. Commons, University of Wisconsin

The Effect Upon French Prices of John Law's Scheme
Earl J. Hamilton, Duke University

Significant Developments in the Field of Money and Banking
Walter E. Spahr, New York University

The Real Wages of Skilled Laborers in London from 1729 to Date
Rufus S. Tucker, Twentieth Century Fund

Discussion: Carl Snyder, New York City
Elizabeth W. Gilboy, Harvard University

10:00 A.M.—III. PROBLEMS OF SAMPLING AND CORRELATION METHODS IN SOCIOLOGICAL RESEARCH

Joint Session with American Sociologial Society

Chairman: R. Clyde White, Indiana University

Suggested Uses of the Method of Multiple Factor Analysis in Sociological Research
Leonard S. Cottrell, Jr., Cornell University

Practical Problems of Sampling Procedure
Frederick F. Stephan, American Statistical Association

Discussant: Paul H. Furfey, Catholic University of America

10:00 A.M.—IV. THE LOGIC OF STATISTICS

Chairman: Frederick C. Mills, Columbia University

The Statistical View of Nature
Morris R. Cohen, College of the City of New York

The Meaning of Probability
Ernest Nagel, Columbia University

Discussion: Truman L. Kelley, Harvard University
Curt J. Ducasse, Brown University
Henry Margenau, Yale University
S. S. Wilks, Princeton University

12:30 P.M.—LUNCHEON MEETING—ARE OLD AGE PENSIONS WORTH THEIR COST?

Joint Session with American Association for Labor Legislation

Chairman: Stuart A. Rice, Bureau of the Census

Speakers: Edwin E. Witte, University of Wisconsin
Margaret Culkin Banning, Author

SATURDAY, DECEMBER 28, 1935

3:00 P.M.—I. THE N.R.A.

Chairman: Malcolm C. Rorty, American Management Association

The Effect of the N.R.A. on the Physical Volume of Production
Leonard Kuvin, National Industrial Conference Board

The Effect of the N.R.A. on the Consuming Public
Q. Forrest Walker, R. H. Macy & Co.

The Effect of the N.R.A. on Corporate Profits
W. L. Crum, Harvard University

Discussant: Lewis H. Haney, New York University

3:00 P.M.—II. STABILIZING OUR BANKING SYSTEM

Chairman: E. A. Goldenweiser, Board of Governors of the Federal Reserve System

Causes of the Banking Debacle
Joseph H. Finnegan, New York University
Fred Rubman, Salomon Bros. and Hutzler, New York
Margaret Souers, New York University

Insurance of Bank Deposits
Mortimer J. Fox, Jr., Federal Deposit Insurance Corporation

Discussant: Arthur R. Tebbutt, Brown University

3:00 P.M.—III. ADMINISTRATION OF UNEMPLOYMENT INSURANCE

Joint Session with American Association for Labor Legislation

Chairman: Edwin E. Witte, University of Wisconsin

The Role of the Federal Government
John G. Winant, Social Security Board

Setting up State Administration
Glenn A. Bowers, New York State Director of Unemployment Insurance

Discussion: I. M. Rubinow, B'nai B'rith, Cincinnati, Ohio
Clarence A. Kulp, University of Pennsylvania
E. Wight Bakke, Yale University
W. Frank Persons, U. S. Employment Service

MONDAY, DECEMBER 30, 1935

9:00 A.M.—BUSINESS MEETING

10:00 A.M.—I. MONEY, PRICES, AND UNEMPLOYMENT

Chairman: Warren M. Persons, Consulting Economist

Price Decline as a Cause of Unemployment
Irving Fisher, Yale University

Does Money Volume Actually Control the Price Level?
Julius H. Spalding, New York University

Discussion: Lucile Bagwell, New York City
Morris A. Copeland, University of Michigan
Jacob Viner, University of Chicago

MONDAY, DECEMBER 30, 1935

10:00 A.M.—II. PUBLIC HEALTH PROBLEMS

Chairman: Edgar Sydenstricker, Milbank Memorial Fund

Plans for Development of the Vital Statistics Division, Bureau of the Census
Halbert L. Dunn, Bureau of the Census

The Development and Use of Neighborhood Vital Statistics in New York City
Marguerite Potter, Department of Health, City of New York

The Frequency of Vaccinations and Immunizations in Surveyed Families in Eighteen States
Selwyn D. Collins, U. S. Public Health Service

Discussion: Robert E. Chaddock, Columbia University
Louis I. Dublin, Metropolitan Life Insurance Co.
Godias J. Drolet, New York Tuberculosis and Health Association
Neva R. Deardorff, Welfare Council of New York City
A. W. Hedrich, School of Hygiene and Public Health, The Johns Hopkins University
Dorothy G. Wiehl, Milbank Memorial Fund

10:00 A.M.—III. CURRENT DEVELOPMENTS IN COMMERCIAL BANKING

Chairman: David Friday, Washington, D. C.

The Quality of Bank Assets
J. H. Riddle, Bankers Trust Company, New York City

The Changing Function of Commercial Banking under Security Capitalism
George W. Edwards, City College of New York

Significance of Broadened Lending Powers of Federal Reserve Banks
E. A. Goldenweiser, Board of Governors of the Federal Reserve System

Discussion: C. O. Hardy, Brookings Institution
W. W. Riefler, Institute for Advanced Study, Princeton, N. J.
Henry C. Simons, University of Chicago

12:30 P.M.—LUNCHEON MEETING—CAUSES OF UNEMPLOYMENT

Chairman: Richard T. Ely, Institute for Economic Research

Relief as a Cause of Unemployment
George B. Chandler, Ohio Chamber of Commerce

Unemployment Insurance and Unemployment
Malcolm C. Rorty, American Management Association

3:00 P.M.—I. UNEMPLOYMENT

Chairman: William F. Ogburn, University of Chicago

The Effect Upon Employment of Regulating Hours and Wage Rates
Robert H. Armstrong, Real Estate and Insurance, New York

Public Works as a Remedy for Unemployment
Noel Sargent, National Association of Manufacturers

Discussion: Frank G. Dickinson, University of Illinois
Arthur D. Gayer, Barnard College, Columbia University

MONDAY, DECEMBER 30, 1935

3:00 P.M.—II. THE TECHNIQUES OF IMPROVING STATISTICAL TEACHING AND PRACTICE

Chairman: Herbert A. Toops, Ohio State University

The Improvement of Statistical Techniques in Biology
George W. Snedecor, Iowa State College

Psychological Improvements in Statistical Practice
Harold A. Edgerton, U. S. Employment Service

Statistical Issues in Scientific Thinking
Truman L. Kelley, Harvard University

Needed Improvements in the Methods of Teaching Statistics
Helen M. Walker, Teachers College, Columbia University

The Improvement of Statistical Textbooks
Wendell Vreeland, Wayne University

3:00 P.M.—III. RECENT DEVELOPMENTS IN FINANCIAL STATISTICS

Chairman: Harold L. Reed, Cornell University

A Broadened Program of Bank Reports
Mortimer J. Fox, Jr., Federal Deposit Insurance Corporation

New Member Bank Statistics
J. E. Horbett, Board of Governors of the Federal Reserve System

New Reports from Security Brokers and Dealers
Carl E. Parry, Board of Governors of the Federal Reserve System

Statistics Relating to Security Markets and Corporations
Paul P. Gourrich, Securities and Exchange Commission

Recent Developments in Corporate Earnings
Leland Rex Robinson, International Securities Corporation

Discussion: William J. Carson, University of Pennsylvania
W. L. Crum, Harvard University
W. W. Cumberland, Wellington and Co., New York City
Wilford J. Eiteman, Albion College

3:00 P.M.—IV. STATISTICAL TECHNIQUE

Joint Session with the Econometric Society

Chairman: Donald R. Belcher, American Telephone Co.

Generalized Multiple Correlation for Pairs of Sets of Economic Variates
Harold Hotelling, Columbia University

The Significance of Points of Inflection in the Determination of Cyclical Variation
Walter A. Baude, University of Cincinnati

Some Problems in Time Series Analysis
Victor S. von Szeliski, National Recovery Administration

Discussion: (a) Theoretical Significance of Papers
S. S. Wilks, Princeton University
(b) Practical Significance of Papers
Robert W. Burgess, Western Electric Co.

MONDAY, DECEMBER 30, 1935

8:00 P.M.—PRESIDENTIAL ADDRESSES

Joint Session with American Sociological Society and American Association for Labor Legislation

Chairman: Lindsay Rogers, Columbia University

Social Theory and Social Action
F. Stuart Chapin, American Sociological Society

Expressing Social Theory in Legislation
Joseph P. Chamberlain, American Association for Labor Legislation

Consolidating Our Gains
Willford I. King, American Statistical Association

TUESDAY, DECEMBER 31, 1935

10:00 A.M.—I. PRICE CHANGES ANALYZED

Chairman: George F. Warren, Cornell University

Effect of Gold Price Change on the Prices of Other Goods and on International Trade
Salem Shapiro, New York University
Marvin M. Wofsey, New York University
Joseph Lehner, New York University
George Eder, Standard Statistics Company

Price Volatility and Flexibility
Paul M. Densen, Johns Hopkins University

The Quantitative Measurement of the Causes of Certain Price Changes
Frank A. Pearson, Cornell University

Discussant: Arthur G. Peterson, U. S. Department of Agriculture

10:00 A.M.—II. STATISTICAL CONTROLS IN BUSINESS

Chairman: Theodore H. Brown, Harvard University

The Kind of Information an Executive Needs to Operate a Factory
Walter F. Titus, International Business Machines Corporation

Bases of Control for Industrial Operation
Fairfield E. Raymond, Massachusetts Institute of Technology

Some Uses of Statistics in Executive Control
F. Leslie Hayford, General Motors Corporation

10:00 A.M.—III. DEMOGRAPHIC STATISTICS

Joint Session with Population Association of America

Chairman: Louis I. Dublin, President, Population Association of America

The Evaluation of the Effect Upon Mortality Statistics of the Selection of the Primary Cause of Death
Halbert L. Dunn, U. S. Bureau of the Census

Geographic Distribution of Net Reproductive Rates in the United States
Alfred J. Lotka, Metropolitan Life Insurance Company

An Empirical Method of Calculating Future Population
P. K. Whelpton, Scripps Foundation for Research in Population Problems

TUESDAY, DECEMBER 31, 1935

12:45 P.M.—LUNCHEON MEETING—THE OUTLOOK FOR 1936

Joint Session with the New York District Chapter

Chairman: Edwin B. Wilson, Harvard University

Speakers: Lionel D. Edie, Edie-Davidson, Inc., New York

David Friday, National Association of Automobile Manufacturers

Leonard P. Ayres, Cleveland Trust Company

1:30 P.M.—BUSINESS MEETING AND ELECTION OF OFFICERS

Minutes of the Annual Business Meeting

A business meeting of the American Statistical Association was held on Saturday, December 28, 1935, at 9:00 A.M. at the Commodore Hotel in New York City. President Willford I. King presided.

William F. Ogburn reported as Representative on the Council of the American Association for the Advancement of Science. He suggested that, since the Council of the A.A.A.S. meets at the time of the Association's Annual Meeting and in a distant city, the Association appoint an alternate who might attend the meetings of the Council when its Representative cannot attend. Mr. Ogburn also suggested that the Association and its sister societies might arrange to meet with the A.A.A.S. more frequently and that the Social Science Research Council might arrange for such a joint meeting. His report was accepted.

Horatio M. Pollock presented the report of the Committee on Statistics of Institutions for Mental and Physical Disorders. His report was accepted.

Thorsten Sellin reported that the Committee on Statistics of Delinquents and Criminals had held no meeting, but through correspondence between its members, it has developed a plan for a research project. It was also continuing its coöperation with the Census Bureau in connection with criminal statistics. This report was accepted.

Meredith B. Givens reported for the Committee on Government Statistics and Information Services. The report was approved with the remark that this Committee had shown a grand record of progress.

Ewan Clague reported for the Advisory Committee to the Secretary of Labor. The report was accepted.

Robert E. Chaddock read the report of the Representatives on the Joint Advisory Committee on the Census. The report was accepted.

William A. Berridge read the report of the Representatives of the American Statistical Association on the Social Science Research Council. The report was accepted.

Irving Fisher announced that the Committee on Fellows had elected unanimously the following Fellows: Donald R. Belcher, Winfield W. Riefler, and Woodlief Thomas.

Howard W. Green presented the report of the Committee on Census Enumeration Areas. The report was accepted.

The report of the Representatives on the Committee to Advise the New York State Department of Social Welfare was given by Ralph G. Hurlin. It was voted to commend the Committee for its excellent work and to accept the report of the Association's Representatives.

The meeting adjourned.

A business meeting of the American Statistical Association was held on Monday, December 30, 1935, at 9:00 A.M. at the Commodore Hotel in New York City. President Willford I. King presided.

The report of the Committee on Statistics of Relief and Child Care was presented by Neva R. Deardorff and was accepted.

Burton H. Camp read the report of the Committee on Technique and Method. This report was accepted.

George H. Van Buren reported as Representative on the National Conference on Nomenclature of Disease. It was voted to accept his report.

Wesley C. Mitchell presented his report as Representative on the Board of Directors of the Encyclopaedia of the Social Sciences. He moved that the American Statistical Association extend its felicitations and its thanks to all those who had taken part in the Encyclopaedia of the Social Sciences. The motion was passed unanimously.

Donald R. Belcher reported as Representative on the Business Research Council. His report was accepted.

The Secretary read the report submitted by W. A. Shewhart as Representative on the Joint Committee for the Development of Statistical Applications in Engineering and Manufacturing. It was voted to accept the report.

The Secretary read the report of the Illinois State Committee prepared by John H. Cover. It was voted to accept the report and to refer to the Board of Directors for their consideration the specific recommendations which it contained.

The Secretary read three amendments which had been transmitted from the previous Annual Meeting. Unanimous approval was given to each of the three amendments as follows:

The last sentence of Article VI shall be amended to read: "Subsequent appointments shall be made by the President of the Association for terms of five years each, but no members of the Committee may serve two terms in immediate succession."

Article VIII shall be amended to read: "The officers of the Association shall be nominated and elected from the membership of the Association and shall consist of a President, a Secretary-Treasurer, six other Directors, not more than eight Vice-Presidents and the Editor of the JOURNAL. Each of the Vice-Presidents shall be elected to represent a distinct field of statistical interest, the field to be represented by each to be designated by the Board of Directors before the date when the nomination for that position is made. The President, Vice-Presidents, Secretary-Treasurer, and Editor shall be elected each year at the Annual Meeting, the manner of their election being prescribed in Article IX. The six Directors other than the President and Secretary-Treasurer, shall be elected at the Annual Meeting at which this amended Constitution is adopted, two for a term of one year, two for two years, and two for three years. Thereafter, two Directors shall be elected each year for a term of three years, the manner of their election being prescribed in Article IX. These Directors shall not be eligible for re-election until one year has elapsed after leaving office. All elected officers shall take office at the close of the Annual Meeting at which elected. The President,

Directors, and Secretary-Treasurer shall form a Board of Directors for the government of the Association, three of whom shall constitute a quorum at any meeting regularly convened. The Vice-Presidents shall constitute advisers to the President and Secretary in the preparation for annual and special meetings, and in matters concerning the interests of the groups they represent in the membership of the Association.

"In case of the incapacity of the President to act on any occasion, the Secretary-Treasurer shall designate which of the Vice-Presidents shall act as President."

Article IX shall be amended to read: "The President, Secretary-Treasurer, other Directors, Vice-Presidents, and the Editor of the JOURNAL shall be elected in the following manner. The President shall appoint a Nominating Committee of three members, the personnel of which shall be announced in the quarterly publications of the Association at least three months before the Annual Meeting. It shall be the duty of the Nominating Committee to make nominations for officers to be elected at the Annual Meeting and to notify the regular members and fellows by mail of its nominations at least thirty days before the Annual Meeting. Twelve or more regular members or fellows may make nominations for any office by submitting signed petitions to the Secretary of the Association not less than twenty-four hours before the beginning of the business meeting at which the election is scheduled to take place. In case a nomination by petition is made, the Nominating Committee may present to the Annual Meeting the names of one or more additional nominees for the same office.

"When but one person has been nominated for a given office, that person may be elected at the Annual Meeting by a *viva voce* vote. If there are two or more nominations for the same office, it shall be the duty of the Secretary to announce such nominations, and, in this case, the election for this office shall be by secret ballot, and the President shall appoint three judges of election who shall count the ballots, shall decide any questions that may arise as to the validity of any ballot, and shall declare the results of the election. The candidate for any position, receiving a plurality of votes cast for that office shall be declared elected. The President shall vote only in case of a tie vote, in which event he shall cast the decisive ballot."

The Secretary presented a proposed amendment to Article X which reads as follows: "Annual and occasional meetings shall be held at such times and places as the Board of Directors may designate. Any vacancy in office resulting from death, resignation, or other cause shall be filled by election at the next meeting of the Association."

The amendment was to strike out the last eight words and to substitute for them "the Board of Directors." Approval of this amendment was moved and seconded. It was then voted to amend the proposed amendment so that it would make the second sentence of Article X read: "Any vacancy resulting in office by death, resignation, or any other cause shall be filled until the next Annual Meeting by appointment by the Board of Directors. If at the

next Annual Meeting there remains an unexpired term for any of the vacancies so filled, the vacancy shall then be filled for the remainder of the unexpired term by election in the manner prescribed in Article IX."

The original motion as amended was then put and approved unanimously, for transmission to the Annual Meeting of 1936 for final consideration.

A business meeting of the American Statistical Association was held on Tuesday, December 31, 1935, at 1:30 P.M. at the Commodore Hotel in New York City. President Willford I. King presided.

The following resolutions were adopted:

RESOLVED that the American Statistical Association congratulates President Willford I. King and extends to him and to the Vice-Presidents, who assisted him, a hearty vote of thanks for the fine program arranged for this Annual Meeting.

RESOLVED that the American Statistical Association expresses its gratitude to Mr. A. T. Falk for his very efficient performance of the many arduous tasks involved in making local arrangements for this Annual Meeting and to Mrs. Helen Slade for her excellent work as publicity representative.

RESOLVED that the American Statistical Association expresses to the managements of the Commodore Hotel and the Roosevelt Hotel its appreciation of their hospitality and service at the Annual Meeting of 1935.

The reports of the Secretary, Treasurer and Editor were presented and accepted.

The Secretary read the list of nominations made by the Nominating Committee, including one nomination by petition which the Nominating Committee transmitted in accordance with Article IX of the Constitution. The nominations were as follows:

President: JOSEPH S. DAVIS
HORATIO M. POLLOCK (*Nominated by petition*)

Vice-Presidents:

1. Collection and Classification of Data and Administration of Statistical Agencies
   MORRIS A. COPELAND
2. Statistical and Actuarial Methods and Technique, and the Teaching of Statistics
   A. R. CRATHORNE
3. Facts and Methods Pertaining to Political Science, Sociology, Social Welfare Problems, and Vital Statistics
   GEORGE E. BARNETT
4. Facts and Methods Related to Anthropology, Biometry, Psychology and Education
   H. A. TOOPS
5. Facts and Methods Bearing upon Economics and Economic Theory
   HENRY SCHULTZ

6. Facts and Methods Pertaining Primarily to Business
F. LESLIE HAYFORD
7. Facts and Methods Pertaining to Financial Institutions
DONALD M. MARVIN
8. Facts and Methods Pertaining to Marketing
PAUL T. CHERINGTON

Directors (for a term of three years): WILLFORD I. KING
H. L. RIETZ

Secretary-Treasurer: FREDERICK F. STEPHAN

Editor of the JOURNAL: FREDERICK F. STEPHAN

All the nominees with the exception of the nominees for the office of President were elected by *viva voce* vote. The President appointed J. F. Ebersole, Eugene B. Patton and Warren M. Persons as tellers. The vote for the office of President was by ballot. Joseph S. Davis was elected President.

It was moved and seconded that the By-Laws be amended to move the offices of the Association from Washington to New York City. It was then moved and seconded to amend the motion by making it read "The Board of Directors is requested to review its action in moving the office of the Association from New York to Washington and to consider the proposal to return the office of the Association to New York City." The amendment was passed. The original motion as amended was passed.

The meeting adjourned.

FREDERICK F. STEPHAN, *Secretary*

Report of the Secretary

During 1935, the activities of the Secretary's office have been expanded and preparatory work has been done toward strengthening the committee work of the Association, increasing membership, developing contacts with government statistics, improving organization, and increasing the value of membership. Suggestions and criticisms from district secretaries and many members have helped greatly in planning improvements in our activities. The Secretary has had the privilege of attending meetings of five chapters and visiting the officers of three additional chapters. These and other contacts with officers and members leave a strong impression of the admirable tradition, the fine spirit, and the very promising opportunities of our Association.

During the year, 209 new members were elected. Seven members were lost by death. Sixty-six members resigned and 119 were removed from the membership list for failure to pay their dues (including 19 who had been carried during 1934 and 1935 at their request without paying dues or receiving the JOURNAL). These changes and reinstatements brought the membership list to 1,742 members on December 1, 1935, an increase of 119 members since the report a year ago. The number of subscribers increased from 474 to 521.

During December, 1935, 14 new members were elected, 7 members were reinstated, the resignations of 10 members took effect and one member was lost by death. At the end of the year, there were 1,751 members, as follows:

MEMBERSHIP STATEMENT, DECEMBER 31, 1935

Honorary members		21
Corporate members		5
Fellows:		
Contributing member	1	
Life members	8	
Other Fellows	78	87
Regular members:		
Life members	21	
Other regular members	1,617	1,640
Total membership		1,751

The following deaths were recorded during the year: Mr. Edward M. Carbon, Professor C. V. L. Charlier, Miss Margaret H. Hogg, Mr. J. Fred Kistler, Mr. J. Herbert Leighton, Mr. Nelson T. Mann, Mr. J. C. Nevin, and Professor Frank H. Streightoff.

During the year charters were issued to the New York District Chapter and the Washington Statistical Society. There were 58 Chapter meetings during the year, as follows: Albany 6, Austin 0, Boston 1, Chicago 6, Cleveland 7, Columbus 0, Connecticut 8, Los Angeles 0, New York 4, Philadelphia 5, Pittsburgh 11, San Francisco 6, and Washington 4.

A Handbook was published and mailed to members as Part 2 of the September number of the JOURNAL. As a result of taking bids for printing the JOURNAL, unit costs have been reduced and an additional 160 pages were published this year without increasing the total printing bill in comparison with last year. Charges for reprints were reduced materially.

With the support of a grant of $7,500 from The Rockefeller Foundation, the Association has been able to strengthen its regular work, to plan for expanding its committee activities, and to make substantial progress toward an enlarged usefulness to its members, to government statistical services, and to the users of statistics. In November, the Directors applied for a further appropriation of $22,500 to enable the Association to continue its enlarged program while it was developing support for the program from regular sources of income. The Rockefeller Foundation has granted this request. The Directors and officers are working to advance the program and direct it toward goals which are of concern to the members. Active participation by many members is necessary if the Association is to realize its opportunities to serve statistics and statisticians.

FREDERICK F. STEPHAN, *Secretary*

REPORT OF THE TREASURER

This report covers a period of thirteen months, December 1, 1934, to December 31, 1935. It includes the month of December, 1934, during which Dr. Willford I. King was Treasurer. A statement of receipts and expenditures is given for the fiscal year beginning December 1, 1934, and for the month of December, 1935, in addition to the thirteen month period. Beginning January 1, 1936, the fiscal year will be the calendar year. This change makes the fiscal year conform with the year used for dues, subscriptions, volumes of the JOURNAL and the term of office of the Treasurer.

In comparisons with previous years, it should be noted that the flow of receipts is heavy in the spring and low at the end of the year. Expenses are heaviest just before and just after the Annual Meeting. The thirteen month period includes expenditures for five issues of the JOURNAL. Consequently, the figures for the fiscal year should be used rather than those for the thirteen month period. Considering the fiscal year, receipts exceeded expenditures by about $800.00, exclusive of the purchase and sale of securities. A balance sheet for December 31, 1935, and statements of receipts, expenditures, and balances are attached.

FREDERICK F. STEPHAN, *Treasurer*

AMERICAN STATISTICAL ASSOCIATION
BALANCE SHEET
December 31, 1935

ASSETS

Current Assets and Investments:		
Cash		
Checking account (American Security and Trust Company)	$ 1,994.35	
Savings account (Emigrant Industrial Savings Bank)	359.44	
Petty cash	13.86	$ 2,367.65
Investments (market value, December 31, 1935)		8,099.00
Receivables		
Accrued interest	$ 16.79	
Accounts receivable	67.50	
Dues receivable, less doubtful items	150.00	234.29
Inventories		
JOURNAL, volumes 1 to 30, inclusive	$ 1,500.00	
Special publications	35.00	1,535.00
Furniture and Equipment, less depreciation		648.18
Total assets		$12,884.12

LIABILITIES AND SURPLUS

Current Liabilities:		
Unearned income		
Dues received for 1936 and following years	$ 795.91	
Subscriptions received for 1936 and 1937	1,608.00	
Miscellaneous credits	29.33	$ 2,433.24
Bills payable		0.00
Liability on account of life memberships		1,980.00
Corporate Surplus		8,470.88
Total liabilities and surplus		$12,884.12

AMERICAN STATISTICAL ASSOCIATION

STATEMENT OF RECEIPTS, EXPENDITURES AND CASH BALANCES

Thirteen Months, December 1, 1934, to December 31, 1935

DECEMBER 1, 1934 TO NOVEMBER 30, 1935

Cash on hand, December 1, 1934:		
Checking account (Corn Exchange Bank Trust Company)	$ 1,256.20	
Savings account (Emigrant Industrial Savings Bank)	350.62	
Cash and checks, not deposited	170.28	$ 1,777.10
Net cash receipts, December 1, 1934, to November 30, 1935:		
General account	$19,071.54	
Special account: The Rockefeller Foundation Grant	7,500.00	26,571.54
Total		$28,348.64
Net cash expenditures, December 1, 1934, to November 30, 1935:		
General account	$17,479.27	
Special account: The Rockefeller Foundation Grant	6,632.96	
Special account: Committee on Calendar Reform	326.86	$24,439.09
Cash on hand, November 30, 1935:		
Checking account (American Security and Trust Company)	$ 3,541.66	
Savings account (Emigrant Industrial Savings Bank)	359.44	
Petty cash	8.45	3,909.55
Total		$28,348.64

DECEMBER 1 TO 31, 1935

Cash on hand, December 1, 1935		$ 3,909.55
Net cash receipts, December, 1935:		
General account		1,275.04
Total		$ 5,184.59
Net cash expenditures, December, 1935:		
General account	$ 1,949.90	
Special account: The Rockefeller Foundation Grant	867.04	$ 2,816.94
Cash on hand, December 31, 1935:		
Checking account (American Security and Trust Company)	$ 1,994.35	
Savings account (Emigrant Industrial Savings Bank)	359.44	
Petty cash	13.86	2,367.65
Total		$ 5,184.59

AMERICAN STATISTICAL ASSOCIATION

STATEMENT OF CASH RECEIPTS AND EXPENDITURES

Thirteen Months, December 1, 1934, to December 31, 1935

	Thirteen Months Period	Fiscal Year Dec. 1, 1934 to Nov. 30, 1935	Month of December 1935
Receipts:			
Dues	$ 9,301.41	$ 8,992.41	$ 309.00
Subscriptions	4,030.32	3,131.45	898.87
Advertising	138.00	138.00	—
Reprints	452.53	452.53	—
Payments by authors	52.50	52.50	—
JOURNAL sales	312.70	311.20	1.50
Books and monographs	135.21	132.71	2.50
Dividends and interest	763.82	701.07	62.75
New York meetings	176.62	176.62	—
Sale of furniture	60.00	60.00	—
Miscellaneous receipts	70.93	70.51	.42
The Rockefeller Foundation grant	7,500.00	7,500.00	—
Total receipts, exclusive of sale of securities	$22,994.04	$21,719.00	$1,275.04
Sale of securities	4,852.54	4,852.54	
Total receipts	$27,846.58	$26,571.54	$1,275.04
Expenditures:			
JOURNAL: printing, mailing and reprints	$ 6,325.03	$ 5,448.86	$ 876.17
Salaries and wages	11,501.47	10,505.59	995.88
Rent	1,128.00	1,038.00	90.00
Office supplies, printing, addressographing and mimeographing	984.79	690.38	294.41
General postage and carriage	545.36	506.63	38.73
Telephone and telegraph	196.98	150.74	46.24
Travel expense	1,152.92	788.88	364.04
Furniture and equipment	684.82	596.00	88.82
Old JOURNALS purchased	305.41	297.06	8.35
Storage of old JOURNALS	126.06	126.06	—
Books for sale	83.27	82.52	.75
New York meetings	304.53	304.53	—
Miscellaneous expense	295.14	281.59	13.55
Refund: Committee on Calendar Reform Account	95.40	95.40	—
Total expenditures, exclusive of purchase of securities	$23,729.18	$20,912.24	$2,816.94
Purchase of securities	3,526.85	3,526.85	—
Total expenditures	$27,256.03	$24,439.09	$2,816.94

AMERICAN STATISTICAL ASSOCIATION

STATEMENT OF BALANCES AND ANALYSIS OF CASH EXPENDITURES BY ACCOUNTS

Thirteen Months, December 1, 1934, to December 31, 1935

	General Account	Special Account: The Rockefeller Foundation Grant*	Special Account: Committee on Calendar Reform
Balance, December 1, 1934	$ 1,450.24	$ 0.00	$326.86
Net cash receipts, December 1, 1934, to December 31, 1935	20,346.58	7,500.00	0.00
Total	$21,796.82	$7,500.00	$326.86
Net cash expenditures, December 1, 1934, to December 31, 1935:			
JOURNAL: printing, mailing and reprints	$ 6,243.57	—	$ 81.46
Salaries and wages	6,488.75	4,872.72	140.00
Rent	312.00	816.00	—
Office supplies, printing, addressographing and mimeographing	894.48	90.31	—
General postage and carriage	501.46	43.90	—
Telephone and telegraph	143.28	53.70	—
Travel expense	149.82	1,003.10	—
Furniture and equipment	138.75	546.07	—
Old JOURNALS purchased	305.41	—	—
Storage of old JOURNALS	126.06	—	—
Books for sale	83.27	—	—
New York meetings	304.53	—	—
Miscellaneous expense	210.94	74.20	10.00
Refund to World Calendar Reform Association and International Fixed Calendar League	—	—	95.40
Purchase of securities	3,526.85	—	—
Total expenditures	$19,429.17	$7,500.00	$326.86
Balance, December 31, 1935	2,367.65	0.00	0.00
Total	$21,796.82	$7,500.00	$326.86

* Appropriated for the calendar year 1935.

Report of the Auditing Committee

We have examined the books and records in the office of the Treasurer of the American Statistical Association, have verified the bank balances, and have checked the securities on hand.

We hereby certify that the Treasurer's report submitted is in accordance with the books and records, and, in our opinion, correctly represents the financial condition of the American Statistical Association as of December 31, 1935, and receipts and expenditures during the period, December 1, 1934, to December 31, 1935.

Arthur F. White
Susan S. Burr

Report of the Editor of the Journal

During 1935, Volume 30 was published with a total of 856 pages, including the Proceedings (218 pages) issued as Part 2 of the March number and the Handbook (70 pages) issued as Part 2 of the September number. Apart from the Handbook, this volume was 90 pages larger than the preceding volume. A survey of progress in mathematical statistics was published in the March issue. The reporting of the statistical activities of government agencies has been expanded.

The Editor wishes to record his appreciation of the fine work performed by Dr. S. A. Stouffer as Acting Editor for the March number and by Dr. Ralph J. Watkins as Review Editor. The coöperation of a number of members who acted as advisers in examining manuscripts was extremely valuable.

Frederick F. Stephan, *Editor*

List of Committees for 1935

Research Committees

Committee to Stimulate and Coordinate Research

Meredith B. Givens, *Chairman*
Burton H. Camp
Morris A. Copeland
W. Leonard Crum
Neva R. Deardorff
Horatio M. Pollock
Winfield W. Riefler
Mary van Kleeck
(The President, *ex officio*, the Secretary and the Chairmen of all the Research Committees.)

Committee on Government Statistics and Information Services

F. C. Mills, *Chairman*
M. B. Givens, *Executive Secretary*
Donald R. Belcher
M. R. Benedict
William J. Carson
Robert E. Chaddock
Ewan Clague
J. F. Dewhurst
Bryce M. Stewart
Samuel A. Stouffer
Ralph J. Watkins

Advisory Committee to the Secretary of Labor

Bryce M. Stewart, *Chairman*
Ewan Clague, *Secretary*
Morris A. Copeland
J. F. Dewhurst
M. B. Givens
Ralph G. Hurlin
Aryness Joy
Murray W. Latimer

Committee on Statistics of Institutions for Mental and Physical Disorders

Horatio M. Pollock, *Chairman*
G. W. Baehne
Frederick W. Brown
Kate H. Claghorn
Mary Augusta Clark
Emil Frankel
Carl E. McCombs
David M. Schneider

Committee on Statistics of Relief and Child Care

Neva R. Deardorff, *Chairman*
F. Stuart Chapin
Emil Frankel
Ralph G. Hurlin
Maurice J. Karpf
Philip Klein
David M. Schneider
Maude E. Stearns
Emma Winslow
Helen Witmer

Committee on Census Enumeration Areas

Howard W. Green, *Chairman*
Clarence E. Batschelet
Robert E. Chaddock
Calvert L. Dedrick
Neva R. Deardorff
R. D. McKenzie
Leon Truesdell

Committee on Statistics of Delinquents and Criminals

Thorsten Sellin, *Chairman*
Morris Ploscowe, *Secretary*
Charles E. Clark
G. E. Gehlke
R. R. Lutz
Bennet Mead
George Vold
O. L. Harvey
Edwin H. Sutherland

Committee on Technique and Method

Burton H. Camp, *Chairman*
Harry C. Carver
W. Leonard Crum
Harold Hotelling
Simon Kuznets
Frederick C. Mills
William F. Ogburn
Paul Rider
H. L. Rietz
Henry Schultz
W. A. Shewhart
S. A. Stouffer

Committee on Labor Statistics

Casimir Sienkiewicz, *Chairman*
Ewan Clague
Carroll R. Daugherty
O. A. Fried
Meredith B. Givens
Gladys L. Palmer
Eugene B. Patton
William H. Stead
Sidney W. Wilcox

Committee on Industrial Statistics

Willard L. Thorp, *Chairman*

OTHER COMMITTEES AND REPRESENTATIVES

Committee on Fellows

Irving Fisher (*For the term expiring December 31, 1935*)
W. L. Crum (*For the term expiring December 31, 1936*)
William F. Ogburn (*For the term expiring December 31, 1937*)
Emanuel A. Goldenweiser (*For the term expiring December 31, 1938*)
Malcolm C. Rorty (*For the term expiring December 31, 1939*)

Committee on Nominations

Warren M. Persons, *Chairman*
E. Dana Durand
Irving Fisher

Committee to Arrange for a Meeting of the International Statistical Institute in the United States in 1939

Walter F. Willcox, *Chairman*
E. Dana Durand
Haven Emerson
(The President and Secretary, *ex officio*)

Committee on Finance

Frederick R. Macaulay, *Chairman*
Dean Langmuir
Malcolm C. Rorty

Committee on Functional Organization and Classification of Members

John H. Cover, *Chairman*
William F. Ogburn
Samuel A. Stouffer
(The Secretary, *ex officio*)
Paul R. Rider
Harry C. Carver
Donald R. G. Cowan

Committee to Appraise the Statistical Evidence of the Causes of the 1929–1932 Business Collapse

Carl Snyder, *Chairman*
S. L. Andrew, *Secretary*
Leonard P. Ayres
Carroll W. Doten
E. Dana Durand
Irving Fisher
Willford I. King
Wesley C. Mitchell
Warren M. Persons
George E. Roberts
Malcolm C. Rorty
Edwin B. Wilson

Committee on Biometrics and Vital Statistics

Lowell J. Reed, *Chairman*
Joseph Berkson
Robert E. Chaddock
Selwyn D. Collins
John Collinson
J. V. DePorte
Harry H. Laughlin
Alfred J. Lotka
Hugo Muench, Jr.
Richard E. Scammon
Edgar Sydenstricker

Committee to Receive and Consider the Report of the Social Science Research Council's Commission on Public Service Personnel

Joseph H. Willits, *Chairman*
William J. Carson
Asher Achinstein

Committee on Special Publications

Frederick F. Stephan, *Chairman*
Harry C. Carver
Meredith B. Givens
Frank A. Ross

State Committee for Illinois

John H. Cover, *Chairman*
Simeon Leland
Robert J. Myers

State Committee for Pennsylvania

Ewan Clague, *Chairman*
William J. Carson
Casimir A. Sienkiewicz

Representative on the Board of Directors of the National Bureau of Economic Research

Malcom C. Rorty

Representatives on the Joint Committee on the Encyclopedia of the Social Sciences

Robert H. Coats, *Chairman* Mary van Kleeck

Representative on the Board of Directors of the Encyclopaedia of the Social Sciences

Wesley C. Mitchell

Representatives on the Joint Advisory Committee on the Census

Robert E. Chaddock (*For the term expiring December 31, 1935*)
Willford I. King (*For the term expiring December 31, 1936*)
Paul T. Cherington (*For the term expiring December 31, 1937*)

Members of the Social Science Research Council

William A. Berridge (*For the term expiring December 31, 1935*)
Seymour L. Andrew (*For the term expiring December 31, 1936*)
Edwin B. Wilson (*For the term expiring December 31, 1937*)

Representative on the Council of the American Association for the Advancement of Science

William F. Ogburn

Representative on the Business Research Council

Donald R. Belcher

Representatives on the Committee to Advise the New York State Department of Social Welfare

Ralph G. Hurlin Horatio M. Pollock

Representative on the National Conference on Nomenclature of Disease

George H. Van Buren

Representative on the Advisory Committee of the American Year Book

Samuel A. Stouffer

Representative on the Joint Committee for the Development of Statistical Applications in Engineering and Manufacturing

Walter A. Shewhart

Reports of Committees and Representatives

Report of the Committee on Fellows

The Committee on Fellows has elected by unanimous vote the following Fellows: Donald R. Belcher, Winfield W. Riefler, and Woodlief Thomas.

Irving Fisher
W. L. Crum
William F. Ogburn
Emanuel A. Goldenweiser
Malcolm C. Rorty

Report of the Committee on Government Statistics and Information Services

This Committee has been actively represented in the membership of the Central Statistical Board during 1935 pending the Board's reorganization under independent legislation passed in the last session of Congress. The Committee's general report, which will present general conclusions and a review of activities during a year and a half of staff work, is in manuscript form and it is expected that it will be published during the early spring. With the creation of the new Central Statistical Board, whose establishment has been delayed by the failure of the third deficiency bill, it is expected that the Committee on Government Statistics will be discharged.

As reported previously in these pages, the work of this Committee has covered a wide range of activities touching all of the principal phases of the statistical work of the federal government. As its task is brought to a close it can report to the sponsoring bodies (this Association and the Social Science Research Council) a high degree of satisfaction with the record of progress in official statistics since the summer of 1933.

The great expansion of governmental activity has created new problems of far-reaching importance yet to be solved, and many fundamental and continuing problems (such as that of a standard, multi-purpose industrial classification, for example) have merely been touched, but outstanding improvements in personnel and in professional standards have been achieved, however, and a new and vigorous central agency remains to stimulate and foster further progress along sound and permanent lines. The Committee's conclusions regarding further needs and possibilities will be suggested in its general report which is based on its own and the collaborating work of the Advisory Committee to the Secretary of Labor.

Frederick C. Mills, *Chairman*
Meredith B. Givens, *Secretary*
Donald R. Belcher
Murray R. Benedict
William J. Carson
Robert E. Chaddock
Ewan Clague
J. Frederic Dewhurst
Bryce M. Stewart
Samuel A. Stouffer
Ralph J. Watkins

REPORT OF THE ADVISORY COMMITTEE TO THE SECRETARY OF LABOR

As indicated in previous issues of the JOURNAL, the Advisory Committee to the Secretary of Labor was appointed by the Association jointly with the Social Science Research Council in accordance with a request made by Secretary of Labor Perkins, in March 1933. Later, when the Committee on Government Statistics and Information Services was appointed to serve several other government departments, the Advisory Committee was lent to the larger Committee and shared in the funds which were available through that Committee.

Staff members of the Committee were actively at work in Washington from the summer of 1933 through to the end of 1934. Since that time the activity of the Committee has been confined to the preparation of a written report. In the course of its activities the Committee prepared material for the Department of Labor, generally for the Bureau of Labor Statistics, on the following topics: employment and payrolls; unemployment; wages, hours, and working conditions; employer-employee relations; consumption and living costs; wholesale prices; retail prices; labor turnover; employment offices; industrial accidents; productivity; labor income; immigration; Federal-state cooperation; statistical organization; personnel; and a number of minor topics.

In several of these fields publications have already resulted from the work which was done. Reference may be made to the article by Aryness Joy, "Recent Progress in Employment Statistics," which appeared in the JOURNAL, December 1934; and to one in the *Monthly Labor Review*, September 1935, by Williams, Hogg and Clague, "Revision of Index of Cost of Goods Purchased by Wage Earners and Lower Salaried Workers." Papers were read before the annual meetings of the Statistical Association by Jacob Perlman, Helen Wright, Margaret Hogg, Howard Myers, and several others. In April 1934, a Preliminary Report was presented to the Secretary of Labor. Final publication will occur as part of the General Report of the Committee on Government Statistics, to be published some time in the spring of 1936.

In reporting on its work the Advisory Committee wishes to emphasize the hearty cooperation given to the Committee by Secretary Perkins and Commissioner Lubin. Not only were all the Committee reports and memoranda noted by these officials, but the recommendations submitted were given careful consideration by the operating bureaus. In recent months the Bureau of Labor Statistics has been submitting to the Committee detailed reports of progress, showing the extent to which the Committee's recommendations have been adopted in the work of the Bureau. Where recommendations have not been found practicable, the reasons for the rejection or postponement have been given.

BRYCE M. STEWART, *Chairman*
EWAN CLAGUE, *Secretary*
MORRIS A. COPELAND
J. FREDERIC DEWHURST
MEREDITH B. GIVENS
RALPH G. HURLIN
ARYNESS JOY
MURRAY W. LATIMER

REPORT OF THE JOINT ADVISORY COMMITTEE ON THE CENSUS

There was only one meeting of the Joint Census Advisory Committee in the year 1935—that held on November 22 and 23.

The Committee at this meeting gave consideration to a program of legislation which had been outlined in the Census Bureau and was designed to accomplish the following objectives: (1) codify the legislation which has been enacted since the permanent Census Act of 1902, and provide the legal basis for a unified program of statistical inquiries; (2) coördinate the work of the Bureau to the end that related inquires are conducted at the same time, or for identical periods; (3) provide an increasing amount of data on a quinquennial and on an annual basis, particularly with regard to the activities of trade and industry; and (4) reduce the severely fluctuating work load now imposed upon the Bureau.

Under this plan the main census inquiries would be covered by comprehensive quinquennial censuses supplemented by annual compilations of more limited scope in intervening years, as indicated by the following resloution which the Committee adopted:

RESOLVED that the Committee favors a quinquennial census covering population, agriculture, and such other related subjects as it may be desirable to include, scheduled for the years ending in "0" and "5"; also a quinquennial census of manufactures, mines and quarries, power units, communication, transportation agencies, trade, and services for the years ending in "2" and "7"; also the plan of making such annual compilations as will preserve the continuity of the data obtained in the quinquennial censuses and administer to the needs of other governmental and private agencies by the more frequent reporting of some of the basic data.

Another item on the agenda of the meeting concerned the question of what the Bureau should do about making estimates of population now that the plan for a quinquennial census in 1935 has been rejected and the method of estimating heretofore followed by the Bureau has proven to be inapplicable to existing conditions. This same question was debated in a conference held last September in which representatives of the Population Association of America, the Special Advisory Committee on Vital Statistics and certain officials of the Census Bureau participated. The resolutions adopted at the meeting of the Joint Advisory Committee on the Census follow very closely the recommendations of that conference.

RESOLVED that the Committee recommend:

1. That insofar as available information will permit satisfactory estimates:
   (a) The Bureau of the Census continue to accept the responsibility for making population estimates;
   (b) Estimates be made for cities having 10,000 or more inhabitants at the 1930 census;
   (c) Estimates be made for counties or for groups of counties;
   (d) Estimates be made for the rural population of states and for the population of cities of 2,500 to 10,000 in each state as a group.

2. That in making these estimates, the Bureau of the Census avail itself of all useful material, whether supplied by its own records or derived from other sources.

3. That the methods for constructing the estimates shall be determined by the Bureau of the Census; and that in publishing estimates the Bureau describe the method or methods which have been employed, and indicate the reliability to be expected.
4. That the Bureau of the Census be provided with adequate facilities for making short-term population estimates.

In another resolution the Committee expressed the opinion that the Bureau would not be justified in publishing any more death or birth rates until satisfactory estimates of population are available.

The Committee was disappointed to find that the Bureau's difficulty in obtaining adequate funds for printing its reports, which has been the subject of resolutions adopted at previous meetings, still continues. Of the allotment for the current year nearly one-half had to be used for printing reports which for lack of funds were carried over from the preceding year. The remainder is now practically exhausted, leaving nothing for the reports now ready or to be completed before the end of the fiscal year. In view of this situation the Committee felt compelled to bring this matter again to the attention of the Secretary of Commerce and the Associations which the Committee represents by adopting the following resolutions:

WHEREAS, the Committee has previously expressed its concern over the fact that the funds allotted to the Census Bureau in recent years for printing its reports have regularly been much below the amount requested and found necessary for that purpose; and

WHEREAS, notwithstanding the fact that the Secretary of Commerce succeeded in 1934 in obtaining additional funds sufficient to print the delayed reports that had accumulated up to that time, the Committee finds that the situation has not improved, but rather has become worse; that nearly one-half of the allotment for the current year had to be applied to the printing of reports that had been carried over from the preceding year because of the exhaustion of the funds for that year; that the allotment for the current year is now nearly exhausted; and that for the printing of the reports which will be completed before July 1, 1936, the Bureau needs something like $40,000 which is not available;

BE IT RESOLVED that the Committee, to its regret, finds itself again compelled to deplore a condition under which, as here illustrated, valuable and costly statistical surveys required or authorized by law are undertaken and conducted without any assurance or certainty that adequate funds for printing the statistics will ever be provided, and that the Committee can but condemn the waste and improvidence displayed by the Government in appropriating money for compiling statistics without making adequate provision for publishing the results of such compilations. Either the Bureau should be provided with funds sufficient to print the results of the statistical compilations which it is authorized or directed by law to make, or else the scope of such compilations should be reduced to come within the limits imposed by the funds that will be available for printing the results.

The Committee followed this by resolution "inviting the attention of the Census Bureau and those responsible for the appropriation or allocation of funds for printing to the possibility of using new processes of reproduction which are more economical than the usual method of printing from type." The Committee had in mind especially the process of "offset printing," and informally approved the use of that process for printing the 1934 Mortality Report already complete in manuscript. The Bureau, in fact, may find it necessary or advisable to use the same process for all the reports that are now ready for publication or will be ready before next July. The list includes

the 1933 biennial report on Manufactures, the 1933 and 1934 reports on Criminal Judicial Statistics, the 1934 reports on Births, Financial Statistics of Cities, Prisoners, Mental Patients, and Mental Defectives, and the 1935 report on Vegetable Fats and Oils—a total of about 2,000 pages.

The Bureau of the Census has for many years published a "Weekly Health Index" giving deaths and death rates for the principal cities of the country, the data being supplied by telegraphic reports sent from the city health office. The question has been raised whether a publication of this kind does not more properly belong in the Public Health Service and overlap or duplicate in some degree the published reports of that Service. It was explained to the Committee that this question had been taken up with a Public Health Service official, and the suggestion made that the publication by the Census Bureau be changed to a monthly, leaving to the Public Health Service the compilation of weekly data. Without expressing any opinion as to what should take its place, the Committee passed a resolution recommending discontinuance of the weekly publication.

EDMUND E. DAY, *Chairman* GEORGE E. BARNETT LEO WOLMAN	Representing the American Economic Association
ROBERT E. CHADDOCK PAUL T. CHERINGTON WILLFORD I. KING	Representing the American Statistical Association

REPORT OF THE COMMITTEE ON CENSUS ENUMERATION AREAS

The Committee on Census Enumeration Areas charged with interesting people in cities of a quarter million or more in census tracts has the following results to report. There were 8 census tract cities in 1910 and 18 in 1930. At the present time 36 of the 37 largest cities in the United States and 11 smaller places have been laid out in census tracts. Four of the members of this Committee have visited eight to ten of the larger cities in an effort to interest people personally in creating and using census tracts for analyzing their population and social statistics. The manual prepared by the Chairman of the Committee and Leon E. Truesdell of the Bureau of the Census has aided people in various cities in preparing the census tract maps and the census tract street indexes.

The Committee held a luncheon and afternoon session Friday, December 27, 1935, to which were invited representatives of census tract cities all over the United States. Six of the seven members of the Committee and 28 guests were present. Fifteen of the 47 census tract cities were represented. "Census Tract Cities" and "Outstanding Uses of Census Tract Data," summarizing the status in each city, were discussed. The Committee is still faced with the problem of getting people in the 47 cities to use the material available by census tracts and to collect additional data by census tracts.

It is suggested that each new publication relating to the application of census tracts in any of the census tract cities be submitted to the Secretary

of the American Statistical Association for review in the quarterly bulletin.

The Committee hopes that it will be possible for the Bureau of the Census to make some tabulations of dollar volume of sales from the Census of Business by census tracts and more detailed data by groups of census tracts. This will make available definite sales data by these geographically constant small areas. The Committee feels that it still faces a problem of working out with the Bureau of the Census a mutually satisfactory and uniform manner of handling the special analyses by census tracts at the time of the next census.

It is believed valuable to continue the activities of this Committee for the promotion of the census tract idea in both new census-tract cities and in those that have census tracts but have not taken full advantage of this "statistical tool."

HOWARD WHIPPLE GREEN, *Chairman*
C. E. BATSCHELET
ROBERT E. CHADDOCK
NEVA R. DEARDORFF
CALVERT L. DEDRICK
R. D. MCKENZIE
LEON E. TRUESDELL

REPORT OF THE COMMITTEE ON TECHNIQUE AND METHOD

Your committee has explored projects Nos. 1 and 2, suggested in the minutes of the meeting of the Committee to Stimulate and Coördinate Research, held at Washington, April 6, 1934. These projects were: 1. Monographs on statistical technique; 2. An annual survey and appraisal of new developments in statistical procedure. It has also considered the possibility of inaugurating at the meetings of the American Statistical Association mathematical lectures on somewhat advanced topics in statistics, the lectures to be not for the purpose of describing unpublished research, but for the purpose of disseminating more widely information already available in the literature. Another purpose would be to expose this material, some of which is controversial, for criticism at the meeting. Your committee have expressed their opinions on these subjects by correspondence and have held a meeting at Ann Arbor in September of this year.

With regard to the first project, it appears to be the concensus of opinion that rugged individualism is already succeeding pretty well in producing such monographs as are most desired, but that if projected monographs of high quality should be proposed by authors who could not obtain publishers without subventions, it might then appear desirable for the Association to attempt to find funds to help such publications. It seemed to the committee that the Association should await an initiative on the part of an author rather than take the initiative themselves and select the authors. In this connection a possible new edition of the "Handbook of Mathematical Statistics" was discussed. However, since the royalties of that book go to the

National Research Council, it appeared that the question of a new edition was a matter for the consideration of that Council primarily, but there was a feeling in the committee that a new edition of the "Handbook" might well be desirable.

With regard to the second project, the committee cannot yet render a final report. Considerable progress has been made, however, because Professor Paul Rider, who had been tentatively selected as the author of such an annual survey, is spending a year of study and research at the University of London. The committee authorized Professor Rider to consult with Dr. Irwin with regard to a possible international program of the sort indicated. Already Dr. Irwin's reviews of mathematical statistics in the *Journal of the Royal Statistical Society* are well known and are of very great value. The material is so comprehensive, however, that it appeared likely that Dr. Irwin would like some further help in making these reviews. Professor Rider has now had a considerable opportunity of consulting with Dr. Irwin and his letters indicate that the hopes of the committee in regard to this matter were well founded and it seems quite likely that it will have a definite program to recommend later.

The committee on the whole favored short lecture courses on special topics in mathematical statistics of the sort suggested above.

BURTON H. CAMP, *Chairman*	WILLIAM F. OGBURN
HARRY C. CARVER	PAUL RIDER
W. LEONARD CRUM	H. L. RIETZ
HAROLD HOTELLING	HENRY SCHULTZ
SIMON KUZNETS	W. A. SHEWHART
FREDERICK C. MILLS	S. A. STOUFFER

REPORT OF THE COMMITTEE ON STATISTICS OF INSTITUTIONS FOR PHYSICAL AND MENTAL DISORDERS

The committee has held two meetings during the past year. In general its activities have been the continuation of coöperative projects upon which a preliminary report was made to the Association at the last annual meeting.

In its coöperative work with the Bureau of the Census, your committee has been fortunate in being represented by Frederick W. Brown, who is official adviser of the Bureau in relation to statistics of mental disorders.

A summary of the present status of the work of the 1933 decennial census of institutions may be of interest. Reports of such census completed include those on penal institutions and the one on hospitals for mental diseases. It is expected that the report on institutions for mental defectives and epileptics will be published before March 1, 1936.

The decennial census of hospitals for mental diseases covers a total of 526 hospitals, the same number as were covered in the decennial census of 1922. Eighty-six per cent of such institutions covered in 1933 were state hospitals. The total patient population at the end of the year 1933 was 435,571. During the six years from January 1, 1928, to December 31, 1933,

the total number of patients in residence in the 171 state hospitals increased by 69,006, from 264,511 to 333,517. The ratio per 100,000 of the general population increased from 222.2 to 263.6, an increase of 41.4 per 100,000. In general the report covers the same material as was covered by the 1922 census. The size of the report has, however, been reduced about one-half by the elimination of tables showing detailed comparisons with previous years. The most important comparisons, however, have been retained.

The report on mental defectives and epileptics has also been reduced in size but its material is readily comparable with that of previous reports. This report covers 156 institutions as compared with 136 institutions in the 1922 decennial report. One-half of these 156 institutions are state institutions. The total number of patients on the books of all of these institutions at the end of the year 1933, was 106,764, of whom 100,676, or 94.3 per cent, were in state institutions. During the six year period from January 1, 1928, to December 31, 1933, the total number of resident patients increased by 26,782, from 60,412 to 87,194, and the ratio per 100,000 of population increased from 52.3 to 69.1, or 16.8 per 100,000.

The Bureau of the Census is continuing its work of collecting and publishing annual data from all state mental institutions. The new classification of mental diseases which your committee has approved has been adopted for the 1935 schedules for hospitals for mental diseases. A new schedule, also approved by the committee, showing the distribution of all mentally-defective first admissions by degree of mental deficiency and by the new clinical classification adopted by the American Association on Mental Deficiency in 1933, will be used in the 1935 reports from institutions for mental defectives and epileptics.

The committee's coöperative effort with the Advisory Committee on Research of the New York State Department of Social Welfare has borne excellent fruit. Ralph G. Hurlin, chairman of the Advisory Committee, requested Horatio M. Pollock and David M. Schneider of the committee to prepare the first draft of a handbook for the collection and tabulation of statistical information on hospital in-patient service. This was done with the aid of Dr. Helen R. Jeter. The draft was revised by the Advisory Committee after conference with representatives of the United Hospital Fund of New York City and the Julius Rosenwald Fund. The handbook is now in press and will be ready for distribution about the first of the year.

Your committee acting through a special sub-committee of which Dr. Emil Frankel is chairman, has continued its effort to promote the establishment of a coöperative state and Federal system of welfare statistics. This proposal, which was submitted by the chairman of your committee to the American Public Welfare Association in December, 1935, may be briefly outlined as follows:

1. Purpose. To secure the organization of a national system of welfare statistics in which the Federal government and the several states would coöperate under the guidance of the Federal Census Bureau or other national agency;

2. Plan of Procedure.
   a. Study of existing laws and practices in the several states with reference to welfare and institutional statistics;
   b. Preparation in coöperation with the Federal Census Bureau and committees of interested organizations of a general statistical scheme or plan setting forth minimum requirements for adequate welfare statistics. When completed the plan would be submitted to the authorities of the several states;
   c. Preparation of model state law relative to the compilation and dissemination of welfare statistics;
   d. Securing working agreements between the Census Bureau and the authorities of the several states whereby data compiled according to a standard uniform plan would be sent in tabulated form directly to the Census Bureau to be incorporated in a comprehensive national annual report for each principal branch of welfare work;
   e. Securing the establishment of a division of welfare statistics in the Federal Census Bureau;
   f. Securing the establishment by the Federal Census Bureau of a registration area to comprise the coöperating states that render satisfactory reports to the Census Bureau. It would be hoped that the area would gradually be enlarged and would finally include the entire 48 states.

The proposal has met with favor in the American Public Welfare Association and in official agencies at Washington. A guarantee of further progress in this direction is offered in the fact that the former director of the American Public Welfare Association, Mr. Frank Bane, who has recently been called to the post of executive director of the National Social Security Board in Washington, is in sympathy with the project. Your committee feels that the creation of the Social Security Board represents a long forward step toward the compilation of more complete and uniform statistical data on social welfare problems in all fields. Assurance of continued coöperation with the committee's work has already been received from Mr. Bane, and representatives of the committee have been invited to confer with him at an early date.

The manual for hospital accounting and statistics which has recently been issued by the American Hospital Association has received the attention of your committee. This manual should prove of great value in promoting uniform accounting in general hospitals.

The tabulation of hospital discharge schedules in the hospitals of New York City which was undertaken by Dr. Neva R. Deardorff, director of research of the New York City Welfare Council, and chairman of the American Statistical Association's Committee on Statistics of Relief and Child Care will be completed within the next six months. This extremely important piece of research represents the development of an inquiry undertaken by

the earlier Committee on Institutional Statistics, which then included Dr. Deardorff and several members of the present Committee on Statistics of Institutions for Physical and Mental Disorders. As director of research of the New York City Welfare Council, Dr. Deardorff was in position to organize and carry on the study of hospital discharges to advantage, although a member of another committee of the Association.

The Committee on Statistics of Institutions for Physical and Mental Disorders has, however, kept in touch with Dr. Deardorff's work, although with some difficulty, because of her transfer to another committee. She reports that about 600,000 hospital discharge schedules have already been analyzed and that the results of this analysis are now being used in a hospital survey of New York City which is being carried on under the direction of Dr. Haven Emerson. The final reports on Dr. Deardorff's study and on the hospital survey will, it is believed, furnish ample evidence of the practical value of thorough-going statistical analysis in social welfare administration.

In its report for 1934, your committee suggested that the Association give consideration to the proposal of Mr. George W. Baehne of the committee for the establishment of an institute for statistical research. Your committee is much impressed by this proposal and again urges the Association's interest on it. No further report can be made on the matter at this time owing to the absence of Mr. Baehne in Europe.

The committee wishes to note particularly in this report the readiness and completeness with which the United States Bureau of the Census, the American Public Welfare Association, the American Hospital Association, and associate committees of this Association have coöperated in the furthering of its plans for improved social welfare statistics.

G. W. BAEHNE	EMIL FRANKEL
FREDERICK W. BROWN	CARL E. MCCOMBS
KATE H. CLAGHORN	DAVID M. SCHNEIDER
MARY AUGUSTA CLARK	HORATIO M. POLLOCK, *Chairman*

REPORT OF THE REPRESENTATIVE ON THE BOARD OF DIRECTORS OF THE NATIONAL BUREAU OF ECONOMIC RESEARCH

The research work of the National Bureau of Economic Research during 1935 has resulted in the publication of Dr. Harry Jerome's *Mechanization in Industry*, Dr. W. A. Paton's *Corporate Profits as Shown by Audit Reports* and Dr. Arthur D. Gayer's *Public Works in Prosperity and Depression*. Dr. Paton's report was prepared with the coöperation of the American Institute of Accountants; Dr. Gayer's report was made to the National Resources Board of the Public Works Administration.

In addition to these bound volumes, there have appeared five *Bulletins:* "Wages and Hours under the Codes of Fair Competition," by Leo Wolman; "Profits, Losses and Business Assets, 1929–1934," by Solomon Fabricant; "Aspects of Manufacturing Operations during Recovery," by F. C. Mills;

"The National Bureau's Measures of Cyclical Behavior," by W. C. Mitchell and Arthur F. Burns; and "Production in Depression and Recovery," by Charles A. Bliss.

Current research is centered upon Dr. Mitchell's study of business cycles. Other current research includes work on the national income, with present emphasis upon securing a continuous series of estimates for years prior to 1929; a study of the amount and distribution of incomes in selected professions; the completion of the work on capital formation; and the launching of a study of capital consumption by Mr. Fabricant. Dr. Mills has been working on the general subject of prices, and has in preparation a manuscript on the structure of prices during recovery. Mr. Bliss has been working on measures of physical volume of production and data as to the interrelationships of various manufacturing industries. Dr. Wolman is completing a survey of trade union membership, bringing up to date his compilation which appeared as a Bureau report in 1924. Dr. Altschul and his assistant, Dr. Strauss, have continued their studies of agriculture in relation to business cycles. Meanwhile, in Washington, Mr. David L. Wickens has had his staff at work on various materials, compiled by the Bureau of Census and in various C.W.A. projects, which bear upon general questions of real estate financing. The major part of this investigation should be completed this coming year.

Special coöperation on research work has been established during the year with Harvard, Columbia, Pennsylvania, Chicago, Minnesota and Wisconsin Universities. This coöperation will concern itself immediately with questions of prices and of the distribution of wealth and income.

As heretofore, your representative, with other directors of the Bureau, has contributed to its work through a critical reading and annotation of advance copies of its studies.

Attention is called again to the fact that members of the Statistical Association are allowed a 25 per cent discount from list prices of the Bureau publications.

M. C. RORTY

REPORT OF REPRESENTATIVES ON THE SOCIAL SCIENCE RESEARCH COUNCIL

The specific interest of the Social Science Research Council is in research leading to new knowledge and understanding of man's life in the midst of a multitude of human relationships and institutions. Around this essential interest lie related and secondary interest with which the Council may regularly or occasionally concern itself. Thus aside from direct research, the Council has regularly sought to perfect the instrumentalities of research through improvement of workers and materials and methods. So also it has on occasion undertaken to render immediate public service by assembling at the disposition of public officials existing resources of knowledge and of men for the solution of technical problems; also, on broader problems of policy and action, to initiate inquiries intended to bring to bear not only

the results of research but all other knowledge and wisdom and opinion that may be available. In both types of aid, the Council has sought to avoid the risks of unduly committing itself—and perhaps, at second remove, its constituent societies—on matters of controversial economic or social policy.

With respect to any enterprise which requires financing, the Council is of course limited by its ability to raise funds. It has become evident that, in order to raise general trust or endowment funds to be expended in its own discretion, it is essential that the Council should itself participate in the selection of its members. A proposal was laid before the Council at its last meeting for nomination by the Council (after consultation with the proper authorities of the American Statistical Association and others of the seven constituent societies) of panels of nominees for election by their respective societies to membership in the Council.

Standing committees have, in 1935, steadily pursued their objectives. Experimental efforts have been initiated to see whether the Council can play a useful rôle in those areas of research for which it is unable to secure any financing. Among the numerous research projects carried on under Council auspices or grants during the year, the major ones have been in the field of population distribution, an enterprise conducted by the Wharton School of the University of Pennsylvania, and in the field of credit and banking in relation to economic stability, a study of real estate financing and the general problem of capital formation, being conducted by the National Bureau of Economic Research. Two major undertakings culminated during the year in the reports of the Commission on National Policy in International Economic Relations and of the Commission on Public Service Personnel. Both Commissions were, immediately on their appointment, given full autonomy; and they, rather than the Council, therefore took the responsibility for the conclusions in their respective reports.

An undertaking of special interest to the American Statistical Association has been that carried on by the *Committee on Government Statistics and Information Services*, established jointly by the Association and the Social Science Research Council. That Committee, designated in June 1933, was most actively at work from then to July 1934, and completed its tasks during the year since elapsed, as is more fully described in the Report of the Committee itself. Although the active staff work of this Committee was terminated on December 31, 1934, the Committee itself has been continued by joint action of the Association and the Council in order to afford opportunity for the completion of its final report and because of the desirability of maintaining committee representation on the Central Statistical Board. This representation is provided for in the Executive Order under which the Board is still functioning because an Act of Congress authorizing a more permanent status was not supplemented by an appropriation of funds for its work.

The Council believes, as apparently does the American Statistical Association also, that through the excellent work of the Committee a highly useful public service has been rendered.

The Council has been fortunate in the matter of special funds for fellowships. During the past year the Committee on Social Science Personnel awarded the eleventh annual series of post-doctoral research training fellowships and two new series of fellowships, the pre-doctoral field fellowships and the pre-doctoral fellowships for graduate study. Appropriations for stipends and allowances totaled approximately $102,000. A distinct, though related, activity has been the continuance of grants-in-aid.

1. Post-doctoral awards included twelve new appointments for periods of one year each, one new appointment for a period of two years, and two reappointments for a full year.

2. Twenty-six pre-doctoral field fellowship awards were made for periods in 1935–36 varying from nine to twelve months. These fellowships, initiated for the purpose of increasing opportunity for experiential training to supplement more formal graduate study, were open to candidates not over twenty-seven years of age who completed all requirements for the Ph.D. except the thesis and examinations dependent upon it not later than July 1, 1935. The response to this new type of award by graduate students and university faculties, as well as the generally high qualifications of the candidates and their proposed programs, has convinced the committee of the great utility of these fellowships in a program for the development of research personnel in the social sciences.

3. Pre-doctoral fellowships for graduate study, awarded for the first time during the past year, include eight appointments from a total of eighty-six applicants, only seventy of whom completed the examinations required of all candidates at this level. They were open to persons not over twenty-five years of age who held or expected to receive the bachelor's degree not later than July 1, 1935, and had not completed more than the equivalent of one semester's graduate study before the same date.

4. The Committee on Grants-in-Aid made fifty awards totaling $23,675 for work during the academic year 1935–36. As in previous years, these awards were for the purpose of aiding mature scholars in the completion of research projects already well under way. The sum of $25,000 which will become available on April 1, 1936, for grants-in-aid of research to be carried on during 1936–37 terminates the four-year appropriation to the Council for this purpose. If these awards are to be continued without interruption new funds must be secured before the summer of 1936. The Council has repeatedly shown itself more attached to grants-in-aid than almost any other item of its program, but it faces great difficulty in securing funds for this pupose.

WILLIAM A. BERRIDGE, *Chairman*
SEYMOUR L. ANDREW
EDWIN B. WILSON

REPORT OF THE REPRESENTATIVES ON THE COMMITTEE TO ADVISE THE NEW YORK STATE DEPARTMENT OF SOCIAL WELFARE

The Committee to Advise the New York State Department of Social Welfare was appointed in 1932 by the Committee on Social Statistics of the Social

Science Research Council, to assist the department during a period of three years in attempting to establish a program for comprehensive statistics of welfare administration in New York State. With the expiration of the specified period the committee has tendered its resignation and has suggested that its functions be transferred to a new committee responsible directly to the State Department of Social Welfare. This suggestion has already been followed. During the past two years the committee has been composed of Emma A. Winslow of the U. S. Children's Bureau, Frank Bane of the American Public Welfare Association, Neva R. Deardorff of the Welfare Council of New York City, Luther Fry of the University of Rochester, William Mosher of Syracuse University, and Horatio M. Pollock and Ralph G. Hurlin, representing this Association. During the three year period the Spelman Fund of New York has made an annual grant to the Department for this project, and during the past year through this means the services of Helen R. Jeter have been available for the immediate direction of the work. The work has been carried on in the Division of Statistics of the Department of Social Welfare, of which David M. Schneider is Director.

While the accomplishment of the three year period falls considerably short of the original expectation, a large amount of careful study has been given to the problem of welfare statistics for the state and carefully devised plans for statistics have now been adopted by the Department for five major fields of welfare administration. The plans have been matured by subcommittees, each including in its membership administrative officers of the State Department, statisticians, and experts in the field of work in question. The fields are: foster care of children, including both child caring agencies and institutions for children; mothers' allowances; private institutional care of the aged; hospital in-patient service; and hospital out-patient service or dispensaries and clinics.

For each of these five fields a statistical handbook has been published during the past year, presenting the report forms to be used, definition and explanation of all items appearing on the forms, the reasons for requiring each item, and complete outlines of tables to be compiled from the reports. The details of the reporting systems vary from field to field. For all fields annual reports are required; in the fields of foster care of children, mothers' aid and private homes for the aged, monthly reports of volume of service are also required; and in the field of foster care of children a report is required concerning each child admitted to care. The plans for annual financial reports are in accord with the principles of modern accounting and represent, it is believed, a particularly noteworthy contribution. These statistical plans have been developed primarily for use in New York State in accordance with the existing legislation in that state. They have, however, been formulated to agree with other existing schemes of welfare statistics and with slight modification in some particulars can be used in other states.

The purpose underlying handbooks is to produce for the respective fields reliable periodic statistics concerning the total volume and cost of work carried on in the state which can be used in planning welfare administration and legislation. The Department in requiring the submission of reports in

these five fields has agreed that the data will be compiled and published in detail. The plan in the field of foster care of children was put into effect on January 1, 1935, and that for mothers' aid during the year, so that the first annual reports under the new plans in these fields will be available during the coming year. In the other three fields the new plans become effective on January 1, 1936.

The New York State Department of Social Welfare has had in effect for several years an adequate plan for statistics of old age relief and the reporting of state-wide statistics of public unemployment relief has been maintained since 1933 in connection with the State administration of unemployment relief. In closing this report it is pertinent to remark that no state in this country devotes more attention to the compilation of statistics of welfare administration than does New York. Even in this state, however, the provision for collection and analysis of welfare statistics lags very far behind that for education, health, and labor statistics. There is still great necessity for attention by this Association to the need for development of welfare statistics in the several states and on the part of the federal government. The fate of the promising program which has been set in operation in New York State will depend largely upon the ability of the State Department of Social Welfare to command sufficient funds to carry out the program.

HORATIO M. POLLOCK
RALPH G. HURLIN

REPORT OF THE JOINT COMMITTEE ON THE DEVELOPMENT OF STATISTICAL APPLICATIONS IN ENGINEERING AND MANUFACTURING

The work of the committee this year, as in the previous one, has been largely that of consulting with men from various industries on special problems. Such requests have come from several new as well as old sources. Members of the committee have been of assistance in such typical problems as: (a) trying to set up criteria for determining how much data should be taken in specific cases; (b) choosing efficient sampling plans; (c) choosing efficient ways of presenting data; (d) writing inspection specifications; (e) establishing adequate criteria for quality control; and (f) interpreting the results of statistical analyses of data. Other services rendered have been the review of confidential memoranda from men in several industries involving statistical problems and the furnishing of references to published work in the theory and practice of statistical techniques. The committee has also continued to function in the capacity of a coördinating agency for similar activities carried on by other committees or institutions both here and abroad.

W. A. SHEWHART, *Chairman*

REVIEWS

Prices in the Trade Cycles, by Gerhard Tintner. Vienna: Julius Springer. Published in Coöperation with the London School of Economics and Political Science by the Austrian Institute for Trade Cycle Research. (Obtainable from G. E. Stechert & Co., New York City.) 1935. xii, 203 pp.

Dr. Tintner has done an important job. After applying an interesting technique to 168 price series from various countries to eliminate random, seasonal, and trend movements, he has subjected the residual cyclical movements to detailed analysis. The measures he has compiled will command the attention of every worker in the field of business cycles. But since these measures do not lend themselves to easy summary, the discussion here will be devoted primarily to a sketch of the data and the statistical technique used by him.

The price data at Dr. Tintner's disposal were the richest heretofore analyzed. Besides using 98 monthly American price series analyzed by Frederick C. Mills in *The Behavior of Prices*, he has collected 77 German series, 71 English series, and 5 from Austria, 12 from Holland, and 3 from Russia. The price quotations are monthly or quarterly and cover varying portions of the period from 1845 to 1914, predominantly 1880 (or 1890) to 1914. With the exception of a few series of interest rates and freight rates, the prices refer to commodities, chiefly in wholesale markets. Restriction to the countries and goods named was forced by the paucity of data and the expense of a laborious analysis. Stopping short at 1914, however, is defended on other grounds. As stated by Professor Morgenstern in his foreword, "the disturbance caused by the war has been so great and so lasting that one may question altogether the fact of a regular cycle after 1914." Whether or not we quarrel with this, the value of any conclusions derived from the restricted period cannot be denied. Economic analysis is difficult enough, and if the number of factors to be considered can be reduced, so much the better. On the other hand, extending the period of examination to include the years following 1914 would have considerably increased the size of the sample of business cycles, and thereby the reliability of the results. The dilemma is a real one, and one should not cavil at the alternative selected.

Dr. Tintner removes the random fluctuations by assuming, first, that they are the results of casual factors (such as small chance elements or episodic events) affecting generally but one term of the series; and second, that the remaining (economic) fluctuations are expressible as continuous functions of time. These assumptions make possible the application of Professor Oskar Anderson's technique (cf. *Die Korrelationsrechnung in der Konjunkturforschung*). The actual process of elimination involves the use of moving averages of varying periods. If either of the assumptions is unpalatable (the behavior of monopoloid prices, which move in step-wise fashion, discontinuously, comes to mind) Dr. Tintner's results need not be rejected, since

the period of most of the moving averages he employs is only three months. (Of 168 series, 111 are smoothed by 3-month moving averages and 33 by 5-month moving averages.)

The economic fluctuations remaining after the smoothing of the series are assumed to be the arithmetic sum of seasonal, trend, and cyclical movements. The seasonal fluctuations are removed simply by a twelve-month moving average. (An attempt is later made by Tintner to estimate the concomitant loss of cyclical amplitude on the supposition that the cyclical movement is purely sinusoidal.) Assuming that the cyclical movements are those remaining fluctuations varying in duration between one year and twelve years (p. 19), Dr. Tintner then applies still another moving average to eliminate them and thus to obtain the trend. This moving average is of varying period, based (roughly speaking) on the number of months between corresponding phases of two contiguous cycles, and centered at the middle month of the period so chosen. The cyclical values are then expressed as percentages of the corresponding trend values. The characteristics of the cyclical movements thus finally obtained are reduced to various measures, some of which are already familiar to readers of Mills' *Behavior of Prices*.

In order to determine relative turning points and other relations among different price series, Dr. Tintner builds up a series of general business cycle reference dates on the basis of Willard L. Thorp's *Business Annals*. Unlike the National Bureau technique, however, in which the reference cycles of each country are different, Dr. Tintner's method combines the reference dates of the six countries considered. In his scheme a cycle is shown even when only one of the countries shows evidence of a business cycle. Since the dates so combined do not quite correctly fit the business fluctuations of any country, there is some danger that individual price cycles will be identified with the wrong reference cycle if their turning points greatly lead or lag behind the changes in general business. More serious, however, may be the treatment thus accorded special cycles in individual price series. Special cycles—fluctuations with a period greater than one year, yet not identifiable with cycles in domestic general business—may reflect business changes in other countries. This may be especially true of prices of commodities entering into international trade. On the other hand, they may be unrelated to general changes in either domestic or foreign business. To set up an international cycle scheme as Tintner does is to assume that all special cycles happening to coincide even very roughly with general fluctuations elsewhere *are* part of those broad movements. This assumption (that it is an assumption is pointed out by Dr. Tintner on p. 49) is not easily accepted. To the extent that the special cycles are not reflections of movements in general business somewhere in the international economy, average turning points will be in error, and uniformities within countries—which might otherwise be visible—will be obscured. A more satisfactory procedure might have been a separate treatment of each country, followed by an examination of international relationships as a possible explanation of special cycles.

Although Dr. Tintner often sets a good example in expressing distrust of

averages based on few items or on items widely divergent, it is to be regretted that measures of dispersion were not computed and presented in detail. For example, the statement is made (p. 61) that the cyclical movement of the interest rate in England leads slightly (by one month) changes in the interest rate in Germany, and that this may be explained by the position of England as the leading capital market. But reference to the appendix (Table V, col. 2) shows the following differences (in months) between turning points in English and German interest rates, in the cycles for which comparison is possible: 0, +1, +17, −3, −2, 0, −10, +2, −14, 0, +4, +4, +1, +3, +3. The median (the figure Tintner quotes) is indeed +1, but the scatter about the median seems too large to be ignored.

The only detailed figures given for each price series are the dates of the turning points. If all averages were supported by the detailed figures the reader could in every case make use of Dr. Tintner's materials to draw his own conclusions. The omission of these measures decreases somewhat the value of the work, especially if the common reference scheme discussed above be rejected. (Even if the reference cycles selected by Dr. Tintner be considered unsatisfactory, a major part of the study remains unaffected, of course.)

The use made of various principles of classification and the discussion of international price relations may only be mentioned. The economic implications inherent in various statistical methods are brought out clearly, and economists who wish to use these methods will gain from a perusal of Dr. Tintner's acute and stimulating discussion.

SOLOMON FABRICANT

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The New Deal and Foreign Trade, by Alonzo E. Taylor. New York: The Macmillan Company. 1935. xii, 301 pp. $3.00.

It is always difficult to assign to a book dealing with social problems a brief title which exactly defines the scope of the book. In this case the title is at the same time too wide and too narrow. It is too wide in that the book is concerned only with foreign trade policies in so far as they constitute a part of the Government's policy toward agriculture. It is too narrow in that a substantial part of the book is devoted to a consideration of American agriculture and the problem of contracting acreage—a problem which is obviously one of domestic significance quite aside from its international implications. It is, in short, a study of the maladjustment of American agricultural production to the demand, both foreign and domestic.

The author justifies this identification of the agricultural problem and the foreign trade problem by the observation that "The Secretary of Agriculture, not the Secretary of State, for the time being at least, seems to be the spearhead of the foreign trade policy of the New Deal." The policies of the Secretary of Agriculture (and, by inference, of the Administration) are taken to be those embodied chiefly in two statements by Mr. Wallace, *America Must*

Choose, a pamphlet prepared for the Foreign Policy Association, and "American Agriculture and World Markets," in the issue of *Foreign Affairs* for January, 1934, and, to some extent, in Mr. Wallace's *New Frontiers*.

The preface asserts that the book is openly but respectfully critical, and the book, as a whole, adheres to this standard. It does not resort to the devices so common to political controversy of attempting to score a point. It is a thorough and well reasoned statement of the case for the opposition. Much more emphasis is placed upon the weaknesses and alleged fallacies of the New Deal policies than upon a constructive alternative policy, though the latter is by no means completely neglected. Concerning this emphasis, the author remarks: "In the social as well as in the physical sciences, it is proper to criticize what is regarded as error without putting an asserted truth in the place of the error criticized," and "The right and duty of criticism are not to be abridged by the inability of the critic to prepare and offer an alternative. But in fact, for the problem of foreign trade, the alternative exists in historical experiences since the industrial revolution."

The views of the Secretary of Agriculture are fairly familiar to all: American agiculture was and is adjusted to production for the foreign as well as for the domestic market. A surplus unsalable at "decent prices" has arisen partly through an increased efficiency of agriculture, partly through a decline in the domestic demand, but especially through the sharp reduction in the foreign market. This reduced foreign demand has come from a number of causes but to a substantial degree has resulted from the unwillingness of this country to accept non-agricultural goods in exchange for agricultural exports. Three policies are available from which "America must choose": (1) the policy of internationalism under which we would more freely accept imports (presumably of manufactured goods) in exchange for exports (presumably of agricultural goods) to an amount sufficient to remove the agricultural surplus; or (2) the policy of nationalism under which we would retain or perhaps raise further our restrictions upon imports and thus indirectly upon exports. Under this policy we must be prepared to retire from production from 40 million acres of good land to 100 million of poor land; or (3) there is the middle course which is to meet the problem partly by increasing exports through increasing imports and partly by contraction of acreage, specifically by about 25 million acres of good land or 50 million of poor land. Mr. Wallace favors the middle course but assures us that the middle course involves planning as surely as would the policy of nationalism. Involved in this planning is apparently the decision on what foreign products we should accept and the negotiation of bilateral trade agreements with the several countries of the world.

Mr. Taylor raises no serious objection to the program of contraction of acreage, either in principle or in details. As to the foreign part of the policy, however, he generally disagrees. He believes that the selection, on any equitable basis, of urban industries to be exposed to the full force of foreign competition is an impossible task, partly because we lack the factual material needed for such decisions and partly because we do not have the national

discipline required to make any such planned program acceptable. Also, he objects to the emphasis upon bilateral trade, again because of the practical difficulties of devising agreements by which our agricultural exports will be taken in exchange for specified goods from the foreign countries. But also there is a general objection to the channelizing of trade and the neglect of multangular trade, which was until recently such a prominent part of world commerce. On this point in particular, Mr. Wallace's policy of "internationalism" will be rejected by those economists who have always considered themselves as internationalists in the sense that they favor the extension of international trade with the least practicable degree of interference. His idea is that we conclude "loans and trade deals with foreign countries as nearly as possible on a bilateral basis and not get involved in the confusing complexities of triangular and polyangular trade with which the economists like to mess up our minds." One must sympathize with the author's rejoinder that it is not the economists who have created the complexity but the events of a century of active world trade between the Napoleonic wars and the World War.

It is obviously not the duty of a reviewer to attempt a judgment between the opposing views. It may be remarked, however, concerning both that there is little faith in the force of the principle of comparative cost, and, furthermore, that both adopt a sort of lump of work doctrine in their views that to increase the imports of manufactured goods will decrease the market for manufactured goods. For example, Taylor says, "To plan an increase of non-agricultural imports equivalent in value to a billion dollars *and sequentially to curtail the operations of urban industries to the extent of a billion dollars.*" . . . Mr. Wallace likewise seems to imply that he favors a policy under which a fair balance between urban industries and agriculture is to be established and that such a policy would have to sacrifice some urban industries, and he does not make clear, if indeed he believes, that other urban industries may be more than correspondingly stimulated.

But there is no reason for assuming that urban industries as a whole would suffer by thus "letting down the bars." Trade obstructions are not simply a protection to manufacturing at the expense of agriculture. They are equally a protection to ineffective manufacturing at the expense of effective manufacturing. Hence, a removal of these protections might very well lead to a stimulus to urban industry as a whole. The reduction or removal of protection would not reduce our exports of manufactured goods, for the exporting industries are obviously gaining no help from trade obstructions. These same industries would gain from such removal of barriers in two ways: (1) from the fact that consumers could buy the products of other manufacturing industries more cheaply and would thus have more to spend on the products of the effective industries; and (2) from the increased purchasing power of agricultural consumers. This, of course, is merely a statement of the old-fashioned view that unhampered trade leads to production at lower costs and to a growing volume of production.

It appears that both these writers have slipped into the depression attitude

that there is a certain amount of production possible and if one industry gets more than its share another will get less. Furthermore, it is interesting to observe that neither Mr. Taylor nor Mr. Wallace gives more than a passing nod to the consumer. Of course, it is true that producers are, by and large, also the consumers, but I believe that much fallacious reasoning has been encouraged in recent years by attacking the problems of the depression almost exclusively from the point of view of the producer. That point of view leads to a search for means by which workers can raise wages, farmers get better prices, and manufacturers in protected industries can maintain their prices. There is, I believe, more hope in policies which look to reducing costs and prices—surely more from the point of view of consumers, which is the most important test, and probably more from the point of view of producers in volume of business and, eventually, in profits.

It is hardly necessary to add that for scope of the questions attacked and for thoughtfulness of treatment, both the positive case by Mr. Wallace and the criticism by Mr. Taylor will amply repay careful reading by students of the social sciences. The two together constitute a discussion of a vital matter of statecraft on a higher plane than has been customary in the treatment of such questions in this country.

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Machinery, Employment and Purchasing Power, by National Industrial Conference Board, Inc. New York: N.I.C.B. 1935. xiii, 103 pp. $2.00.

The major objective of the authors is to prove the fallacy of the widely prevalent view that the use of machinery in production tends to a permanent increase in unemployment. On the whole, the evidence presented is not new but consists of a skillful marshaling and comparison of the available estimates of unemployment, occupational shifts, production, mechanization, and income.

Briefly, the conclusions reached are (1) that except in depressions the larger part of unemployment is due to sickness, injury, old age, labor disputes, and seasonal fluctuations; and that there is little or no evidence to indicate that the machine aggravates either seasonal or cyclical unemployment; (2) during the period of rapid mechanization the percentage of the population classified as gainful workers has actually increased rather than declined, and there is no clear evidence of an upward trend in the rate of unemployment among the working population; and (3) since the turn of the century the productivity and the real income of the worker have increased substantially despite a 10 to 15 per cent shortening of the average working week.

These results, it is urged, are not surprising, because in large part machines have been utilized to manufacture new commodities or to improve the quality of old products, and, even when used to increase the quantity of old products, the result has often been an increase in the total output at a lower price rather than a sharp reduction in the labor force.

The brevity of treatment leads in a few instances to statements which are ambiguous or inadequately supported by the evidence presented. How, for example, can one reconcile the estimates that from 1899 to 1929 weekly hours of labor in manufacturing declined 14.8 per cent, and output per wage earner rose 68 per cent, but output per man-hour rose only 60 per cent (page 85)? With a shorter work week it would appear that output per wage earner must have risen less than output per hour. But the observed discrepancies do not impair the main argument in essential respects, and not much elaboration of details can be expected in so short a treatise.

Probably few readers will question the conclusion that in the long run the machine has increased rather than decreased employment, except to point out that mechanization means an increasing roundaboutness of production and thus aggravates the elements of uncertainty and misjudgment which contribute to cyclical fluctuations. Moreover, the concentration of attention on the long-run effects may be considered to be merely tilting at windmills. Of more practical concern are the immediate hardships, perhaps limited in time but nevertheless real, which come to particular individuals or groups from obsolescence of their skill or from complete elimination of their jobs by rapid mechanization. This book does not provide an adequate analysis of the short-time effects of mechanization but is a useful addition to the literature of the long-run effects.

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The Formation of Capital, by Harold G. Moulton. Washington, D. C.: The Brookings Institution. 1935. xi, 201 pp. $2.50.

The Formation of Capital is the third of a series of studies which have appeared in the past year or two under the supervision of the Brookings Institution. Immediately preceding have been *America's Capacity to Consume* and *America's Capacity to Produce*. Following it is to be a general volume consolidating the ideas set forth in the three preceding inquiries. These four volumes are included in a study of the "Distribution of Wealth and Income in Relation to Economic Progress" and have been carried out with funds granted by the Falk Foundation of Pittsburgh.

Here we have a study of a most important topic—the relation of economic society to its financial organization, which is apparently presented coördinately with analyses of production and consumption. The implication, plainly, is that credit organization and distribution is to be treated as of an importance similar to the study of the producing and consuming arrangements of society. It is not certain that the author intended to suggest as much, or even to imply that the financial mechanism is as independent of, and as detached from, the other branches of economic organization as is true of the arrangements or institutions discussed in the other volumes. At any rate, *The Formation of Capital* is, in fact, chiefly a specialized study of banking and of bank credit methods, to which has been assigned a title evi-

dently intended to direct the attention of the reader to the connection between manufacturing and business on the one hand and banking and investment on the other. It is a province of study that is now much in the public eye and is already the field within which a very large literature is being steadily developed.

As the third in a series of connected monographs, Mr. Moulton's book thus represents an important conception—the thought that money, banking, and credit, are no longer to be dealt with as independent technicalities, but as phases of the great processes of production, distribution, and consumption of income. Unhappily, the "integration" of the volume does not fully bear out the expectation thus formed nor does the technique of it satisfy the standard of accuracy and reliability which the student in this field must exact. The two preceding monographs were themselves statistically sketchy and inadequate, and their apparent incompleteness and immaturity of judgment—letting alone statistical or other errors of fact—tend to invalidate much of the author's treatment and to make its conclusions appear at best suggestive rather than informative. Generally speaking, Mr. Moulton endeavors to form a theory of credit which will assume a place as a phase of the theory of production and investment. In so doing, either lack of data or lapses of judgment have led him to make a good many extreme statements. His general conclusion is that "if new capital is to be created there must be an increasing flow of funds through consumption channels as well as through savings channels." In other words, he feels that the growth of capital is possible only if goods are regularly sold and consumed. Apropos of this, we may recall that particular one of Mill's five fundamental propositions respecting capital which states that everything that is produced is consumed, both what is saved and what is spent, and the former quite as rapidly as the latter. To take it at its face value, Mr. Moulton appears to have developed in his statement a grasp of the already obvious and long admitted truth. His use of his "discovery," however, appears when he makes the statement that "the facts" (details not given) show incontrovertibly that new capital is constructed on a substantial scale when consumption is expanding rather than when it is contracting; whereas, he says that when both consumption and capital goods are being increased, there is an expanding flow of funds through both consumption and investment channels. What is meant here by the vague word "funds" is not altogether clear though the general thought is simple. In short, the main conclusions of *The Formation of Capital* are either obvious or in doubt, and the impression left by the book is that of a hasty attempt to prove something without success in indicating exactly what conclusion has been reached.

It is, after all, largely as an offshoot of this credit discussion that *The Formation of Capital* is interesting and worth while. A very large part of the book is devoted to the analysis of bank credit and the reasons for dealing with it as we do, particularly the question of how far an increase in bank credit means an increase in price. On this point, the author arrives at the conclusion that the professional type of analysis ignores the relation of con-

sumptive demand to the formation of capital and that the close connection usually assumed between growth of bank credit and increase of prices does not exist. This appears to have been a conclusion reached some time ago by the author in articles published by him in the *Journal of Political Economy* and backed up (after the fact) by references to various recent British writers on prices and cyclical changes. The author appears to be, on the whole, "on the fence" as between the so-called "inflationists" and their opponents. There is suggestive material in the chapters referred to but he is apparently handicapped to some extent by what he had done sixteen or seventeen years ago, when this discussion was still at a very much earlier stage. From what has been said, it might appear that the volume was non-partisan in treatment or, at least, that it did not commit itself to any given school. Such freedom from dogmatism, however, cannot be claimed by *The Formation of Capital*. The repeated statements that "We have already demonstrated . . . ," or, "the facts incontrovertibly show . . . ," or, "there can be no doubt that . . . ,"—all indicate that the book has been written in anything but a non-dogmatic frame of mind. This tone tends to impair the usefulness of the work from a scientific standpoint and might, to the great advantage of the monograph, have been modified.

On the whole *The Formation of Capital* is more interesting for what it suggests than for what it contains. It is what the Germans call a *tendenzschrift*—it indicates the drift of money and banking discussion and is thus interesting, although it reaches very doubtful conclusions and leaves the reader about as wise as he was before he read it.

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The Great Depression, by Lionel Robbins. New York: The Macmillan Company. 1934. xiv, 238 pp. $3.00.

In this noteworthy study Professor Robbins, of the University of London, examines the causes of the world depression and traces the development of economic and political events from 1914 through 1933. His analysis of the depression and of measures necessary for recovery is based upon an abstract theory of economic equilibrium in which salient factors are free competitive markets in the buying and selling of goods and with respect to the factors of production, relative freedom of international trade, and the unhindered operation of the pre-War gold standard. Any restriction which keeps prices from falling to the cost of the marginal producer or which keeps the international flow of gold from giving rise to offsetting changes in national price levels, he regards as elements of disequilibrium.

What were the causes of the depression? Primarily, "monetary mismanagement and State intervention operating in a *milieu* in which the essential strength of capitalism had already been sapped by war and by policy." The general causes then were the World War and the subsequent economic maladjustments which gave rise particularly to economic nationalism. By

monetary mismanagement Professor Robbins refers primarily to the mistakes of the central banks: in England, the mistake in stabilizing the pound at too high a parity; in the United States, the mistake in lowering rediscount rates in 1927 in order to assist Great Britain in remaining on the gold standard. With the pound stabilized at too high a value there should have been a considerable decrease in credit and deflation in costs. By State intervention, the author has in mind assistance given to monopoly organizations both among producers and among workers. Monetary mismanagement in his opinion is primarily responsible for the general inflationary movement which led up to the crisis of 1929. (In this connection, Professor Robbins develops the outline of what he calls a "possible Trade Cycle.") Expansion in the producers' goods industries was stimulated by abnormally low interest rates, which were the result of banking policy and not of increased savings. New monetary claims resulting from increased activity in the heavy industries after a time filtered down to the ultimate recipient, but there was no increase in the proportion of income saved. The demand for finished consumers' goods, therefore, was strengthened, profits in the industries making these goods rose, and the rate of interest also began to rise. Other costs followed and it soon became apparent that the anticipation of large funds at low rates of interest for investment in the producers' goods industries was illusory. The investment in lines of industry most affected by the rate of interest—building and construction—became unprofitable. The demand for capital goods fell off, and a depression began in the heavy industries. The major financial mistake, then, was the lowering of interest rates unaccompanied by an insufficient increase in the volume of savings.

Why was the depression so severe and so long? Professor Robbins indicates that this was a result both of pre-depression influences and of mistakes which arose after the depression began. Among the former were War dislocations which had not been removed by the end of the 1920's, notably the capital shortage in Germany and in Central Europe and the resulting tremendous variations in the rate of interest among countries; the fact that the decrease in agricultural prices resulting from technical improvements coincided in part with the industrial depression; inelasticities resulting from policy, in particular the monopolistic action of trade associations and cartels aided by tariffs and general State approval and similar action by trade unions also assisted by State measures, especially unemployment insurance; and a major inflation, disguised by a constant price level, which greatly overstimulated the capital-goods industries and led up to an unusually severe depression in those industries. The major errors committed after the beginning of the depression are held to be the adoption of protective tariffs as a cure for declining business and other State efforts to save a business situation which was fundamentally unsound, especially in the United States. Here the author refers to the efforts to hold up purchasing power and wages and the assistance given to weakened firms, without respect to whether they were essentially unsound or not. Specifically, he mentions the action of the Federal Reserve Board in initiating its open market policy in 1930 and in arresting the neces-

sary process of deflation and postponing the liquidation of bad business situations,[1] and, further, the subsequent propping up of unsound positions by the Federal Farm Board, by the Reconstruction Finance Corporation, and similar efforts.

What are the prerequisites for recovery? The first essential is the return of business confidence aided by the immediate stabilization of exchange rates and the final return to the pre-War gold standard. The second is the freeing of international trade by the abolition of quotas and by a general decrease in tariffs. The third essential is the restoration of the adaptability of the economic system by the elimination of all kinds of inflexibilities. Wages and prices must be allowed to rise and fall in relation to relative demand and must not be isolated from the influences of the market by the power of cartels and labor organizations. Professor Robbins holds that flexibility would be restored if the State withdrew all assistance. "So far in the history of the world cartels and labor organizations exercising strong monopolistic influence have not shown themselves to be capable of survival save as a result of direct or indirect assistance from States." A greater flexibility of wage rates would, in the author's opinion, materially assist in reducing unemployment.

Such, in broad outline, are the major conclusions of an economic study which is unusually lucid and logically organized. Among contemporary British and American economists, Professor Robbins' exposition is of the best. His meaning is clear and his theoretical analysis stimulating.

Two critical observations may be advanced: first, Professor Robbins overemphasizes the possibility of the general reestablishment of a free market, and, second, he underestimates or neglects sources of instability other than those of monetary mismanagement and State intervention. To hold that if the State did nothing to bolster up monopoly (in particular if tariffs were drastically reduced), monopoly as a source of inflexibility would be eliminated is to overlook the existence of international control of raw materials, the allocation of markets by international sales organizations, the opportunity in large countries for monopoly control in interior markets protected by transportation costs from foreign competition, the additional opportunity for monopoly control where products must be produced locally, the exceedingly small number of competitors in some industries, the possibility of price control where the relative level of costs of an industry under monopoly or partial monopoly control are considerably lower than that of foreign competitors, and other factors which facilitate the growth of monopoly. Action more drastic than the withdrawal of State intervention and the downward revision of the tariffs would be necessary to create a free competitive market in all products. Indeed, actual Government interference may be necessary to preserve competition in those cases where there is collusion among competitors with respect to price or by regulation to approximate the results of

[1] Professor Robbins is very pessimistic about the outlook for democratic government unless elasticity is restored to the economic system; he holds that the postponement of deflation in Germany, particularly with respect to the writing off of bad debts, provided the immediate occasion for the Nazi Revolution.

competitive conditions in instances of duopoly or of a relatively small number of producers.

Professor Robbins holds that the removal of State unemployment insurance and other indirect State supports of trade unions would restore the elasticity of wages. Such action might bring home the relationship between the level of wage rates and relative unemployment to those unions where the demand for the labor of their members is elastic, but the author overlooks the fact that the demand for labor is probably relatively inelastic in some important occupations and that public feeling about "just" or "fair" wages has tended to augment the inflexibility of wage rates. The author's remarks apply with less force to the United States than to England because of the lack of unemployment insurance in this country. Yet despite the absence of such assistance from the State, trade unions have felt little pressure to reduce rates in order to decrease unemployment; the unions in this country are mainly craft unions with little feeling of responsibility for the effect which high rates for skilled labor may have in decreasing the total demand for unskilled labor. Inelasticity in wage rates in the United States may in part result from Government pressure but is more likely to follow from the widespread conviction that high wages are necessary for the healthful operation of the economic system and, in those instances in which wage rates are the most rigid, from trade union strength. Witness the rigidity of rates in the buildings trades.

To point only to monetary mismanagement and State interference as sources of instability and inflexibility in the economic system is to overlook the influences of reparations, war debts, changes in the debtor-creditor positions of the United States and Germany, the spread of industrialism over the world since the War, the increasing proportion of total costs which are fixed and invariable, the slowing up of population growth, and the consequent slowing up of the growth in demand for agricultural products. The marvelous adaptability of the capitalistic system which the author refers to and which he feels would be restored if central banks and the State generally would refrain from interfering with the operation of the economic system may have been very real during a period of expansion but may be seriously impaired during a period of marked retardation in the rate of industrial growth and of impending decreases in population.

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The Role of Money, by Frederick Soddy. New York: Harcourt, Brace and Company. 1935. x, 212 pp. $2.00.

This book is a curious mixture of scientific investigation, moral reform, unproved premises, and incomplete analyses. Its basic theme is that all economic ills are directly traceable to our credit system, and that when this has been improved, according to the author's suggestion, all will be well with the economic system.

In elaborating his thesis, Soddy begins with a vigorous denunciation of traditional economic theory as belonging to a past age of scarcity. Modern science has ushered in a new age of plenty which demands a new economic theory. This body of theory is developing "from the application of the principles of the sciences of the material world, physics and chemistry, to economics and sociology." This new body of doctrine is *Ergosophy*, "the wisdom of work, energy, or power, in the purely physical sense."

There is one insuperable obstacle which impedes the flow of wealth from producer to consumer made possible by modern science, the money system. Its fundamental defect is that it permits wealth to be confused with debt. To prove this thesis he restates his theory of money and virtual wealth. Money should be looked at, not as it has been traditionally, that is, as a means of purchasing, but rather from the point of view of the goods and services given up to obtain the money. "Money now is the nothing you get for something before you can get anything." The owner of money is the creditor, and the issuer of money is the debtor. The chief issuer of money in our credit society is the banking system, so it is upon the bankers that the full responsibility for economic ills must be placed. Bankers, by creating money, are getting something for nothing. This power should be transferred from banks to the government. Then, as loans are repaid, the government should put the money back into circulation by buying with it securities representing the national debt, the securities then being destroyed. Moreover, money should be issued on a new basis, not to producers at the beginning of production, when it causes great fluctuations in business, but to consumers in relief of taxation, after the new production has matured.

The one good point in this book is the author's constant emphasis on the instability of our credit system. Otherwise, it is an illustration of a most unscientific and incomplete attempt at investigation without proper consideration of the pioneering work of other scholars, whose efforts he so lightly dismisses.

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French Import Quotas, A New Instrument of Commercial Policy, by F. A. Haight. London: P. S. King & Son, Ltd. 1935. xi, 125 pp. 7s. 6d.

Opposed in principle to trade restrictions, Mr. Haight has undertaken to study the French import quota system as typical of quota systems which, he believes, have assumed "a position of permanence in the new commercial policy of many nations." In this volume, the evolution of the quota system in France from the emergency measures of 1931 to protect agriculture and industry from the deflationary influence of falling prices to its development as a bargaining instrument is traced; the two types of quotas, unilateral and bilateral, are differentiated and appraised; the techniques and difficulties of administration are discussed; and their use in the new bilateral trade agreements is described. In two other chapters, there is an attempt to analyze

by means of the presentation of statistical material the effects of the quotas on imports, direction of trade, the exporting industries, the trade balance, and the French price level. Although these chapters contain assembled material of importance bearing on the economic and financial dilemma of France, it has been a well-nigh impossible task to separate out the specific effect of quotas as distinguished from clearing agreements, the equalization tax, higher tariffs and other trade barriers, not to mention deterrents to foreign trade in the world at large.

Import quotas, Mr. Haight concludes in a summary chapter, are an "extraordinary measure" undertaken by France to correct a dangerous unbalance of trade at a time when the usual means of high tariffs, deflation, or devaluation were insufficient, impractical, or politically impossible. Although he would have preferred a program involving the denunciation of the treaties in which tariffs were consolidated, and the use of tariffs which "do not destroy the price system," he does admit that "quotas afford much better protection than do tariffs against a flood of goods from countries with depreciating currencies." In another paragraph, this opponent of the principle of reciprocity and of national self-sufficiency states that the planning of foreign trade, a corollary of the new philosophy of autarchy, "is a logical development of the quota system." This statement would seem to confuse the technique with the policy it has been made to serve, although it is patent that the success of such a system is dependent upon scientific planning. During the past four years import quotas have been commandeered by some 26 countries to protect individual currencies and national price levels or to promote the aims of economic nationalism. Whether this defense mechanism and bargaining weapon will become an orthodox instrument of future trade policy will depend both upon the success of the present experiments and upon the *set* of the trend, toward or away from the principles of liberalism.

The book includes a series of thirteen tables containing price and foreign trade figures, a tabulation of the French quotas, and two graphs which illustrate the effect of the quota system on the internal price level. One of the first in the field, this study represents a significant contribution to the literature on foreign trade.

ETHEL B. DIETRICH

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Wheat Studies of the Food Research Institute (Stanford University).

"Decline in Wheat-Flour Export During the Depression," Vol. XI, No. 2, October 1934, pp. 39 to 73. $.75.

"Per Capita Wheat Consumption in Western Europe," Vol. XI, No. 7, March 1935, pp. 255 to 305. $1.00.

"Spreads between Wheat Prices in England," Vol. XI, No. 8, April 1935, pp. 307 to 325. $.50.

"World Wheat Survey and Outlook, May 1935," Vol. XI, No. 9, May 1935, pp. 327 to 358. $.50.

"International Wheat Policy and Planning," Vol. XI, No. 10, June 1935, pp. 359 to 404. $.75.

"World Wheat Prices, Canadian-Argentine Spreads, and the Ottawa Agreement," Vol. XII, No. 2, October 1935, pp. 35 to 56. $.50.

Throughout the depression, students of the wheat situation have devoted major attention to estimating and explaining the decline in the international movement of wheat. In view of this fact, it seems most fitting that a special study should be devoted to the parallel situation in respect of flour. The wisdom of such procedure becomes still more clear when evidence is supplied to show that the decline in international trade has been decidedly more marked in flour than in wheat. The most interesting and valuable feature of the study devoted to this subject, however, is the attempt at listing and evaluating the various factors contributing to flour-export decline. Although the analysis is confined largely to the United States export situation, most of the factors cited apply universally, if with varying degrees of intensity. Indeed the special consideration of United States exports has permitted inclusion of one factor which the author rightly considers to be of prime significance. We refer to the claim that the chief reason for the drastic fall in United States flour exports has been the existence of a higher wheat price in Chicago than in the wheat and flour importing countries. It is pointed out that the influence of the wheat price on flour exports is specially pronounced in a country such as the United States in which millers have developed the practice of hedging their operations. Other factors held responsible for the greater decline of flour relative to wheat exports include the tendency to discriminate in favor of wheat as against flour in the matter of freight rates, tariff rates, and other import restrictions. A most important suggestion is that, from the political point of view, the special regulations restricting the ways in which bakers in importing countries could use imported flour are likely to become permanent and to constitute the chief barrier to the recovery of the international flour trade.

The study devoted to per capita wheat consumption undertakes to investigate trends in respect of wheat consumption in 13 Western European countries during the past 50 years. Special emphasis is placed on the necessity of distinguishing clearly between the different wheat uses when attempting estimates of total utilization. Total consumption must be subdivided into human consumption and livestock consumption, and total utilization must also include wheat used for seed. A major disclosure is the wide variation among countries in the manner in which total consumption is subdivided. Non-food uses are very important in some countries, but not in others; and non-food uses have greatly expanded since before the war in some countries but not in others. A most significant, if somewhat tentative, deduction is drawn from the data covering food consumption of wheat. It is that there is little evidence to substantiate the common assumption that wheat tends to displace rye completely in national diets. On the contrary, the view is here advanced that, in countries where rye has long been important in national diets, the probable course of development, even over

a very long period, may be the striking of a definite balance between the use of wheat and the use of rye rather than the complete displacement of rye by wheat. A further important fact revealed is the general difficulty of securing reliable statistics of past wheat consumption.

The investigation regarding the spreads that have existed between wheat prices in England during the past decade was in part an attempt to test the feasibility of establishing a set of price differentials on import markets, such differentials to reflect the differences in the types, grades, varieties, and qualities of the various wheats imported. The study reveals that, in practice, the spread between the prices paid for different kinds of wheat has been subject to rapid and wide variations, thus indicating that the price paid was at least partly determined by factors other than the precise character of the wheat itself. Six other factors are listed. The general conclusion is that the arranging of fixed price differentials is a much more complicated matter than many advocates of the idea have supposed.

Of very special significance is the excellent and timely analysis of the problem involved in attempting to plan the production and distribution of wheat internationally. It is impossible here to do more than commend the author for having produced an exhaustive treatment of a most important subject and to commend the study itself to all students who are interested in the general subject of international planning. Generally speaking, the possibilities of successful planning in respect of wheat are held to be distinctly limited. Of particular interest is the well substantiated claim that wheat is a commodity which is inherently unsuited for international planning purposes.

W. M. DRUMMOND

University of Toronto

The International Protection of Labor, International Labor Organization, History and Law, by Boutelle Ellsworth Lowe. New York: The Macmillan Company. 1935. lxxiii, 594 pp. $3.50.

This volume consists of a short historical summary of the international labor movement, an extensive collection of documentary material, and a bibliography of the publications of some eleven countries. The summary discusses the part played by socialists, trade unionists, social reform groups, and governments. There is also an account of the various congresses, labor conferences, and labor legislation recommended and adopted. One chapter is devoted to the relation of America to the movement, another to the arguments for and against international labor regulation.

In the first edition the author carried the history of the movement down to the Second Session of the International Labor Conference at Genoa in 1920. The present edition extends the history through the Eighteenth Session of the International Labor Organization (1934). The new material includes a brief description of the later sessions of this international body, of recent social legislation in the United States and its relation to the movement, of

our acceptance of membership in this organization, and of the change in membership of the governing body of the organization. The documentary history has been brought up to date and a short bibliography of recent publications added.

The author's investigation of this subject has led to a strong conviction in support of international labor regulation. His treatment, however, of the arguments for and against such regulation does not adequately examine the economic factors in the problem. More attention, for example, might have been given to such factors as unequal distribution of resources, population, capital, and business ability. They represent barriers which if not insurmountable are just as serious as political and social factors in limiting the possibilities of international action with reference to labor. Again the changing character of competition and international trade, the development of new industrial techniques, the growth of nationalism, and the attempts at self-sufficiency and economic planning all suggest new elements in the problem which need evaluation. A discussion of some of these factors would have been helpful.

The author has, however, succeeded in bringing together a very useful collection of documentary material and a valuable bibliography. He has given a brief and concise account of this international movement.

J. W. HOWELL

Carnegie Institute of Technology

The Measurement of Population Growth, by Robert R. Kuczynski. London: Sidgwick & Jackson, Ltd. 1935. vi, 249 pp. 12s. 6d.

This excellent book should be of much help to those working on the larithmics of population growth because of its analysis of census and vital statistics and of methods of measuring fertility, mortality, and natural increase. Emphasis is laid on birth statistics and on rates of fertility, gross reproduction, and net reproduction, since "the decisive factor in determining present population growth is fertility" rather than mortality as in former times. Frequent references are made to studies of historical interest, and throughout the book the points under discussion are liberally illustrated by retrospective tables for many countries (27 full-page text tables and many more smaller tables). Although listed as one of a series of "Text Books of Social Science" there is no bibliography, list of suggested readings, or questions for discussion as in so many American texts. Perhaps because the book is published in England the analysis and criticism of English vital statistics and reports of the Registrar General is in much greater detail than that of other countries, covering nearly 40 pages.

The appraisal of birth statistics (Chap. I) deals with simple tests for completeness, the basis of classifying stillbirths and live births, and the allocation of legitimate births and illegitimate births among single, married, widowed, and divorced women. The need for careful scrutiny of basic data is emphasized.

Vital statistics alone have been used in measuring fertility, especially in the past; e.g., ratio of births to marriages, etc. (Chap. II). The numerous errors inherent in these methods are pointed out and attempts at correction discussed. Because the latter can only be partially successful at best, the conclusion is that if census data are available there is no excuse for depending entirely on vital statistics.

Census statistics alone permit fertility to be measured much more accurately than do vital statistics alone; e.g., ratio of children to women, and number of children born to each woman (Chap. III). However, the latter method—as used and made world famous in the English Census of 1911—has serious drawbacks.

Measures of fertility based on both vital and census statistics discussed in Chap. IV include crude birth rate; general, specific, and total fetility rate; and gross reproduction rate of all women. Of these the last is the most accurate but requires the most basic data. Several methods of estimating it, and certain substitutes for it, are analyzed and held inadequate, including standardized birth rates computed by the indirect method and fertility rates derived from a single census but applied over a long period.

In Chap. V defects in early life tables are pointed out together with improvements made at later dates. Special emphasis is laid on "the features with which the student of population growth must be familiar in order to be able to use a complete life table and also to construct an abridged life table sufficiently correct for measuring the net reproduction of a population." Crude, life table and standardized death rates are compared with respect to their accuracy in measuring mortality to the advantage of the second, and showing crude preferable to standardized under certain conditions.

Attempts to measure the balance of births and deaths by the vital index are held to be futile and outmoded (Chap. VI). A much superior concept is the net reproduction rate; a still better concept is the rate of increase of a stable population, i.e., a population constantly subject to present specific fertility and mortality rates. Methods of calculating both are explained.

Although this book seems to the reviewer to be an excellent work, there are a few minor criticisms that may be pertinent. At places the author is rather dogmatic, for example, "The [Mexican] figures for 1931 and 1932 may be accepted as fairly accurate" (p. 8). Moreover, unless one is omniscient it would seem desirable to qualify such a statement as "The first fertility table was calculated in 1884 by Richard Böckh" (p. 207), since further historical research may bring an earlier table to light.

Probably because the author has worked more with European vital statistics and the reviewer with American there are points of disagreement centering around the analysis of ratio of children to women, a measure of fertility more useful in this country. Since most mothers who migrate take their children with them, the reviewer disputes that "it was utterly misleading to relate the 90,815 children under 10, enumerated in Ohio in 1810 to the 39,426 females from 16 to 45 enumerated in 1810, since those females, in

1800, numbered 7,203 only." A ratio of children to women would be misleading, however, if mothers (but not children) were suddenly decimated shortly before the census and migrated to heaven unaccompanied. Furthermore, Rossiter's proposal to relate children under ten to the mean population of the preceding decade (p. 98) is not accepted by the reviewer as progress. Where there has been much migration it is a step backward, giving spuriously high ratios under inward migration (as in the Ohio case above) and spuriously low ratios under outward migration. Of course it is as true with general fertility *ratios* as with general fertility *rates* that the age distribution of women in the childbearing period cannot be neglected.

On pages 192–194 an analysis of English data shows the standardized death rate to be inferior to the crude in indicating trends in mortality, taking the correct (life table) death rate as the ideal measure. With the correct death rate and hence the standardized death rate tending to become stationary as more difficulty is experienced in lengthening the expectation of life, and with the crude death rate tending to rise as the age composition of the population becomes less favorable, the reviewer believes an analysis of English data thirty years from now will lead to the opposite conclusion.

P. K. WHELPTON

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Blindness and the Blind in the United States, by Harry Best. New York: The Macmillan Company. 1934. xxii, 704 pp.

This volume, which is a revision and expansion of Dr. Best's earlier work, *The Blind*, published in 1919, is a comprehensive reference book designed to cover all phases of the prevention of blindness and the work for the blind in the United States. Exhaustively documented and heavily interspersed with statistical tables, it arouses the reader's admiration for the patient industry with which the author pursued his task, seeking only to dignifiy by academic procedures and factual data the cause of the blind—a group about whom all too little literature is available, and that little too often colored by sentiment or prejudice.

Respecting, as one must, Dr. Best's devotion to his purpose, one regrets more deeply the defects in the material with which he chose to deal. His book is based very largely upon the census of blind persons taken in connection with the general population census of 1920, in which 52,567 blind persons were enumerated. The United States Bureau of the Census authorities themselves acknowledged that this enumeration was probably only 65 per cent complete; workers for the blind, basing their opinion on the registration of the blind in certain well-organized states, estimate that it was probably only about 50 per cent complete.

Therefore, if the figures presented in the census report are to be regarded as having validity, it is necessary to assume (1) that the enumeration was equally incomplete in all parts of the country, and (2) that those blind per-

sons reported are truly representative of the total blind population as regards age, sex, race, cause of blindness, occupation, etc. Unfortunately, no grounds for either assumption can be shown. It is entirely possible, for instance, that the blind in urban areas were more completely reported than those in rural districts, that children of pre-school age were more likely to be omitted than older brothers and sisters in school, and that blind persons employed in subsidized workshops were more frequently included than those who lived with and were supported by their married children. There is no means of resolving these questions, for they are inherent in the census method when it is applied to a group so scattered, so heterogeneous, and so difficult to define. (England has substituted for the census of the blind a scheme of national registration with excellent results.) But, in view of these important factors of unreliability in the basic data, the tabulations and analyses based upon them are of questionable value.

Even if the census figures could be assumed to be either complete or representative, it must be noted that they were gathered in 1920, fourteen years before the publication of Dr. Best's book, and make no allowance for the developments in the social and industrial world since that time, by which the blind, no less than the seeing, have been affected. In explanation, it should be stated that, on most points, no more recent census data were available, for the 1930 census of the blind was limited to the items appearing on the general population schedule.

It may well be that Dr. Best's greatest contribution lies in having focused public attention on the crying need for reliable, comprehensive, and up-to-date statistics of blindness and the blind.

EVELYN C. MCKAY

American Foundation for the Blind

Foreign Bondholders and American State Debts, by Reginald C. McGrane. New York: The Macmillan Company. 1935. vii, 405 pp. $4.00.

Serious depressions bring with them the contraction of credit and the cessation of loans. With reduction in economic activity, taxes become less remunerative and more painful to bear, and many governments find difficulty in meeting their obligations. In the international field the stoppage of loans and purchases by the creditor country makes it difficult if not impossible for the debtor countries to find the exchange with which to pay interest on previous borrowings. Accordingly, there is always in such cases the possibility of defaults upon governmental bonds as well as upon private obligations. The two crises which illustrate to us most strikingly the weakness of governmental credit in such emergencies are those of 1837 and 1929. Americans played the part of debtors in the first and of creditors in the second. During the early 1840's nine American states failed for a time to meet their interest charges; and, of these, four repudiated all or a part of their obligations. In the present depression the war debts due to the United States have been defaulted by all but one minor debtor, and twenty foreign govern-

ments have ceased interest payments on bonds held by American citizens. Thirty-two per cent of the American-held foreign bonds have been in total or partial default. In each case the situation has been so controlled by the implacable limitations of governmental finance and international exchange that the will of any set of governmental officials has been rendered to a large degree powerless. Nevertheless charges of moral perfidy have been hurled at debtors by creditors. In 1843 the Reverend Sydney Smith, because ofthe failure to receive the interest on his Pennsylvania bonds, declared:

> A great nation, after trampling under foot all earthly tyranny, has been guilty of a fraud as enormous as ever disgraced the worst king of the most degraded nation in Europe.

American denunciations of European nations in recent years have been similarly lacking in restraint.

Professor McGrane has done an exceedingly useful task in reviewing at this time the defaults and repudiations of American states in the forties of the last century. There were two principal problems connected with the debts, the difficulty of collecting sufficient taxes to bring into the state treasury enough funds to meet the debt charges, and (this applies only to that part of the debts held in foreign countries) the obstacles of international exchange in the transmission of payments to bondholders abroad. The author devotes himself almost entirely to the first of these difficulties. He traces fully and clearly the defaults and repudiations that occurred in the individual states, the resulting sentiment in Europe and in this country, the failure of the movement for Federal assumption of the debts, the pressure for the resumption of payments, and the revenue programs of the states. He also traces the comparatively swift revival of foreign confidence in American governmental obligations which began about 1848. A second wave of defaults and repudiations came in the seventies following the reckless financing under carpetbag governments in the Southern states. The fall of the carpetbaggers was followed by repudiation. Many Southerners naturally felt that there was no moral obligation to pay these bonds.

The volume is a valuable part of American literature on public finance. Should the student of government wonder why limitations upon the financial powers of legislatures have been placed so profusely in state constitutions, he may find his answer in these pages. And the impatient nationalist who constructs his whole scheme of international values on the financial relationships of the last two decades should turn here for perspective and understanding.

BENJAMIN H. WILLIAMS

University of Pittsburgh

Analysis of the Real Property Inventory and Financial Survey of Urban Housing for Peoria, Illinois, by the Research Division of the Federal Housing Administration. Washington, D. C. 1935. vi, 194 pp.

This book of 194 pages includes 53 half-page charts each accompanied by a brief tabulation of the data shown on the chart, 20 large folded-in maps,

199 tables segregated to the appendix, and 55 partly filled pages of text equivalent to approximately 42 full pages.

Part I deals with the economic background of the city: population, composition and growth; business activity; income tax returns; postal receipts; marriage licenses; and similar data from which it was concluded that Peoria is economically sound.

Part II deals with the housing situation in the city as a whole: trend in ownership and mortgage encumbrance; age and condition of structures by monthly rental; number of rooms by type of dwelling; congestion by rental; rent delinquency; mortgage indebtedness; source of mortgage money; interest rates; and a multitude of other data including income data.

Part III deals with the housing situation, analyzing by blocks, land use, vacancy, congestion, tenure, condition of dwelling, facilities, values, rents, and so forth, based on the real property inventory.

Vacancy is calculated on rented and vacant family units, assuming that all vacant family units are for rent when, as a matter of fact, probably some of them are for sale only. Blocks in which most homes are owned show high vacancy ratios calculated in this manner. Vacancy is usually based on the sum of the units owner-occupied, the units tenant-occupied, and the vacant units.

The data obtained from the Financial Survey of Urban Housing determined by an enumeration of each tenth block and by mailed schedules received from a part of four-tenths of the blocks have been analyzed by enumeration districts in a more detailed manner, including figures on income, rent delinquency, age of dwellings, mortgaged homes, and delinquency.

These enumeration districts were combined into economic areas based on opinions obtained from people in Peoria. This section, as might be anticipated, was not productive of as helpful material as it might have been if the economic areas had been created from the analysis of the data made available by the study.

Part IV deals with factors affecting property values.

Several attempts were made to test the stability of the small areas by determining the change of values, rents, and income between 1929 and 1934. In a less abnormal period such tests might be expected to be worth while.

Changes in income may be quite misleading unless it is fully recognized that comparisons have been made of the income in 1929 and 1932 of each group based on 1933 levels rather than being grouped on 1929 and 1932 levels respectively. This limitation does not affect the validity of the average incomes during each of these three periods, but the distribution of the families in income groups of 1933 only are of value.

The publication is most attractive; the colored maps are excellent, the charts clear and easily understood in spite of the fancy printing used in the titles.

The report serves a useful purpose. As the author states, "this report is of primary significance in illustrating a technique for treatment of data pro-

vided by the Real Property Inventory and the Financial Survey of Urban Housing and by surveys of a similar nature."

HOWARD WHIPPLE GREEN
Real Property Inventory of Metropolitan Cleveland

The Building Industry and Business Cycles, by William H. Newman. Chicago: University of Chicago Press. 1935. vii, 73 pp. $1.00.

This monograph contributes materially toward an understanding of the causes of building fluctuations and of the role of building in business-cycle phenomena. After emphasizing the importance of distinguishing major and minor building cycles, Mr. Newman says, "Of prime importance to an understanding of these major cycles are shifts in population and the events associated therewith. . . . A shift of population geographically is as important as an increase in the total . . . shifts in population occur in waves—waves which correspond very closely with the major building cycles." These waves in population movements anticipate major changes in building activity by a year or two.

The relationship of money-market conditions to major movements in building is less close. Although availability of long-term funds will contribute to the major-cycle rise, once it is under way, "the pressure for new buildings may be sufficient to outweigh even tight money-market conditions." Concerning building costs, no evidence was discovered that they "are the controlling factor in constructional activity. While costs usually moved independently of building, such connection as was found suggests that changes in building activity cause changes in building costs, rather than vice versa."

Although major building cycles undoubtedly "affect the shape and the duration of business cycles, . . . it is the minor fluctuations in building which correspond in nature and time limit to business cycles." Because of the critical importance of building trends at turning-points in business and the "independence of the two series in minor movements and in whole cycles," it is contended that "building fluctuations arise, to a considerable extent, independently of 'business cycles.' " When the direction of business is in the balance, however, the building industry is often of critical significance. The role played by financial conditions is far more important in minor building cycles than in major building cycles.

Of especial interest is the chapter in which Mr. Newman discusses the bearing of his conclusions upon business-cycle theory. For example, the theory that changes in production costs cause inverse fluctuations in business activity is not substantiated by the analysis, since fluctuations in building activity were found to be independent of the level of building costs. In regard to the role played by uncertainty in business-cycle phenomena, it is argued that "the longer the period necessary to change the supply brought onto the market and the more sluggishly the market reflects a change in

supply or demand, the more extreme will be the overexpansion or overcontraction. Experience of the building industry clearly indicates that this element of uncertainty plays a part in fluctuations of activity."

Proposed means of stabilizing the building industry are not considered encouraging. "In the main, a choice must be made between (a) budgeting production which involves the regimentation . . . of economic life, and (b) fluctuations in activity arising as a consequence of an uneven rate of progress." The author clearly feels that a considerable degree of stagnation is inevitable under the former plan and that the latter plan combined with certain methods of mitigating the fluctuations is to be preferred.

F. L. CARMICHAEL

University of Denver

Real Property Inventory of the Cleveland Metropolitan District, Report No. 4 of the Real Property Inventory of Metropolitan Cleveland (takes place of Volumes No. 1 and No. 2), by Howard Whipple Green. 1935. 291 pp. $15.00.

Movements of Families within the Cleveland Metropolitan District 1934, Report No. 5 of the Real Property Inventory of Metropolitan Cleveland (takes place of Volume No. 3), by Howard Whipple Green. 1935. 223 pp. $15.00.

These volumes are primarily data books in significant fields over which fog abounds. The immediate light they bring may be mainly of benefit to the people of that district and people outside the district who have important interests there. But it may be assumed that until specific data of the same kind are available for other great urban areas the information on the Cleveland area will be taken in many ways to illuminate urban conditions elsewhere. Moreover, the stimulus from the Cleveland surveys has already been widely felt, and the accomplishments there in the development of method are reflected in many other community inventories. Since these reports come from what is largely a pioneering project, the purpose of this review will be mainly to introduce the volumes.

Real Property Inventory of the Cleveland Metropolitan District is the third annual report of that name issued under the direction of Howard Whipple Green. In 1932, under his direction, an enumeration was made in the Cleveland metropolitan district of dwelling structures, family dwelling units, residential occupancy and vacancy, the several types of non-residential buildings, and stores. The survey was made with the coöperation of the post office, the postal carriers doing the field enumerating. A similar count was made in 1933 and another in 1934. Each enumeration was tabulated and reported, the volume at hand following the 1934 survey. In addition to the most recent data gathered by the postal carriers, each report included information for a number of years on subdivision activity, deeds, mortgages, foreclosures, building, and demolition. This third volume is enriched by the inclusion, both in tables and in the accompanying text, of much information

from the two earlier enumerations. In addition, there are two significant reports on special surveys, one a study of use of street frontage on main business thoroughfares, and the other an industrial survey. The extensive data from the Federal R.P.I. of the Cleveland district are not included but are published separately.

Although useful summary information for the metropolitan district and for each of the political subdivisions is given, Mr. Green has shown especial interest in the presentation of census tract data on dwellings, stores, office buildings, lots and unallotted acreage, new subdivisions of land, new construction, and demolitions. The census tracts, it should be noted, are relatively small, there being 321 in the Cleveland metropolitan district. The report on street frontage is handled by political subdivisions, then by streets, then by street segments of a few blocks each. The information on industries and industrial space is presented for each of ten geographical sections. Summary charts also are used, but most of the graphic presentations, like most of the tabular pages, are built of data for the small areas. The very sharp differences among areas, brought out clearly by numerous shaded maps, show fully the justification for Mr. Green's persistence in dealing with neighborhood units.

In *Movements of Families within the Cleveland Metropolitan District*, as in the other volume just discussed, Mr. Green's emphasis rests on the presentation of census tract data. This volume is the second issued under that title, the first being based on 1933 data and this one on 1934 data and on information for the two-year period. Movements within the district and movements out of or into the district were studied, on the basis of public utility records. One accustomed to the rather solid look and feel of Cleveland is confronted here with an astonishing picture of a huge continual shuffle of population. The enormity of the movement is probably in part a reflection of depression conditions. But there are always many families, many neighborhoods, and many properties in depression. Moreover, the well-remembered scramble for quarters in better years indicated that moving is also a boom phenomenon. Probably, therefore, movement of families is always of large volume; but there had been no large-scale study of such movement prior to that in the Cleveland area.

On one feature of the presentation of the data in these volumes, there seems to be just cause for criticism. Only the last six of the numerous tables in the first report are numbered; none in the second. None of the charts and maps are numbered, nor are any keyed by direct reference to appropriate tables. Occasional errors or ambiguities of reference in the first of the two volumes are directly traceable to the lack of numbering. In the second, the difficulty has to be handled by numerous page citations.

The text, serving as helpful introduction to the statistical material, is useful also because of the inclusion of much information from the earlier surveys. In the first of the two volumes, however, some of the assumptions appear dubious. Two significant instances will be noted. The degree of non-competitiveness assumed with reference to different areas and different types of

property (page 3) seems too high, in view of the notable differences among areas and among types of property, shown in the same volume, with respect to change in residential vacancy, in subdivision, and in new building. There is an assumption (page 8) that vacant family units unfit for use probably will not be occupied again and that occupied family units unfit for use will be vacated by improved income of the occupants or by condemnation and razing. But most slum property was occupied in the best times we have experienced; that occupancy was not confined to those who couldn't afford better quarters; and condemnation and destruction of unfit property, except in relatively limited degrees, remain yet a mere aspiration. This assumption, therefore, appears to be more a wish than a carefully weighed expectation.

It is unfortunate that Mr. Green did not address himself to the specific task of indicating social uses of the data offered. At this rather advanced stage of his work, he would no doubt have been able to offer a helpful contribution in that respect.

J. P. WATSON

University of Pittsburgh

Insurance and Annuities from the Buyer's Point of View, by E. C. Harwood and Bion H. Francis. Cambridge, Massachusetts: American Institute for Economic Research. 1935. xiv, 167 pp. $2.50.

The authors would probably claim little originality in their description of life insurance and annuity contracts. This is probably the most accurate portion of the work, although it lacks the care in arrangement which might have contributed to clarity. Unfamiliarity with the science of life insurance is evident at many points, as in the emphasis placed upon "expectation of life" and the "most probable year of death," in regarding mortality and loading salvages as "profits," in confusing the value of a company's assets with the value of its reserve, and in failing to distinguish between "actual history" and "present scale" bases for dividends. Throughout the entire book is evident a total lack of appreciation of the services which life insurance may render in relation to thrift, investment, and the meeting of emergencies—a lack so glaring in view of modern life insurance developments as to disqualify the authors for their assumed role of expert advisers.

Possibly the only sections of the book which might be regarded as original are those concerned with the rating of companies and the comparison of contracts as to cost. These are so obviously superficial and ignore so many factors which should enter into any equitable comparisons as to be dangerously misleading to the reader who acts on them. Their hazard is aggravated by suggestions on the replacement of old policies with new ones, a practice which has been vigorously and properly opposed by companies having the welfare of their policyholders at heart.

It is very strange that a book which purports to be unbiased and which is published under the imprint of an organization whose name closely resembles that of a well-known scientific body should contain in the main-part of the

text an offer to provide certain reports, analyses, or detailed study for a stated scale of fees, a form also being provided in the appendix for the reader to use in submitting information on his personal insurance program. After seeing this, one cannot help but quote a passage which was applied (of course) in another direction: "It simply is not reasonable to expect sound and unbiased advice regarding the product they are selling from the people who have it for sale."

The writer of this review agrees with the authors that "for a large portion of all buyers, their life insurance policies are the most important purchases made throughout their lifetime." Buyers need sound advice. But the field is still open for a good book from their point of view.

DAVID MCCAHAN

University of Pennsylvania

Cyclical Fluctuations in Commodity Stocks, by Ralph H. Blodgett. Philadelphia: University of Pennsylvania Press. 1935. xii, 172 pp. $2.50.

Business cycle analysis must include an explanation of what happens to stocks of goods during the various phases of the cycle. Yet writers on the subject have been content to rest the case with a deductive argument on what ought to happen to such stocks. Comparatively little statistical verification of these deductions exists. This book is a report of a rather exhaustive statistical study carried on for the purpose of filling in the gap in our information concerning the behavior of stocks of goods in prosperity and depression.

The stocks of 35 different commodities have been analyzed for the period from 1919 to 1932. For each commodity the cyclical changes in stocks of goods have been compared with the cyclical changes of (a) general business, (b) production, (c) prices, (d) consumption. These comparisons provide a vast amount of detailed but valuable information. It is impossible to summarize this information within the compass of a brief review. The stocks of some commodities have inverse cyclical movements with reference to general business, but positive movements with reference to production or price. A number of other such combinations appear in the course of the study.

The author finds no such general uniformity of behavior of stocks of commodities as the usual cycle analysis would imply. The nearest thing to a generalization which he is willing to hazard is the following:

> those stocks of raw and partly-processed materials and of finished products at the producers' which increase and decrease as general business expands and contracts are, in general, very small at all times, while those stocks which are, in general, large in size show cyclical fluctuations which are inverted to those in general business.

The statistician interested in method will find this volume something less than satisfactory, because the description of the method is too brief and because none of the data or analyses are presented. The method of treating the data for trend, seasonal, and cyclical components is that developed by

Professor Kuznets. No critical analysis of the accuracy of the application of the statistical method is possible because of lack of information.

This book is a decidedly valuable addition to the literature devoted to analysis and verification of business cycle theory. The reviewer feels that in several instances conclusions have been drawn which will require revision when data for a period longer than 12 or 14 years become available.

M. A. BRUMBAUGH

University of Buffalo

Retail Price Behavior, by John H. Cover. Chicago: University of Chicago Press. 1935. viii, 92 pp. $1.00.

Professor John H. Cover was delegated by the Committee on Government Statistics and Information Services to study the problem of the more adequate collection and analysis of retail prices. *Retail Price Behavior* is a first report of the results of this investigation and contains not only the recommendations made to the Federal Inter-departmental Committee but also inferences for which Professor Cover assumes sole responsibility.

The purpose of the project was twofold; namely, to identify and measure some of the factors affecting retail prices and to propose an organization and procedure for collecting and analyzing prices. Although these objectives were inspired by needs arising from the National Industrial Recovery Act and the Agricultural Adjustment Act, their attainment is obviously of value to economists in general. In determining "real" wages, for example, a need has long been felt for a more adequate breakdown of cost of living data.

Of particular interest is the list of communities proposed as an adequate basis for a national pricing system. These communities represent the regional, population, industrial, trade, climatic, and social variations in the United States. Of these 237 communities, eight have been selected for the test survey of prices which is analyzed by Professor Cover. On the basis of this test survey, recommendations are made concerning the measurement of price variations attributable to differences in types of commodities, of communities, and of retail stores. The remarks on sampling problems will be of interest to any one engaged in market research.

Although *Retail Price Behavior* reports only a small step taken toward the complete attainment of a national pricing system, the immensity of the undertaking is made clear, and, by the sound recommendations on organization and procedure, further progress is made less difficult.

A. W. ZELOMEK

International Statistical Bureau, Inc.
New York City

Financial Aspects of Corporate Net Worth, by Arthur H. Winakor. Bureau of Business Research, University of Illinois Bulletin No. 50. 1935. 34 pp.

Changes in the Financial Structure of Unsuccessful Industrial Corporations, by Raymond F. Smith and Arthur H. Winakor. Bureau of Business Research, University of Illinois Bulletin No. 51. 1935. 44 pp.

The work of the accountant furnishes the raw data for presenting satisfactory information to the business manager and investor. These facts cannot be used in their original form but need to be developed into ratios, averages, etc., developing standards and other suitable means of comparisons before the layman is able to grasp the true meaning of the figures, spread on the balance sheet and income statements. The two studies indicated above are efforts at such analyses. Teachers of corporation finance should welcome such investigations, for they add content to the study of some very practical problems.

The first study is an attempt to show the value of a careful analysis of net worth as a guide to a proper interpretation of the financial position of any corporation. The author realizes that net worth depends upon estimates made by engineers and accountants but that, when properly analyzed, they will give satisfactory clues for practical judgments. From the small sample used, a conclusion is drawn that successful corporations increase their net worth relative to total assets, and in periods of prolonged depression, this relative increase is accelerated. If one ties up the second study with the first, Mr. Winakor might have strengthened his proposition by concluding that where corporations fail to increase net worth relative to total assets they are headed for the rocks. The statistics offered in the second study point to the conclusion that the gradual decrease of net worth to total assets is a danger signal for both business man and investor.

The second study is an attempt to show that it is impossible to get a complete picture of the financial position of a corporation by the use of any one ratio. Alexander Wall, in his studies of ratio analysis, pointed this out several years ago. The present study is of particular interest in its attempt to select certain ratios and to present statistical data to substantiate the argument. Working capital to total assets is suggested as an unfailing guide to the financial position of a corporation. The authors contend this ratio is a more accurate guide, and it gives its cue much earlier than other current ratios. Current assets to total assets appear to give as clear an indication of the financial position, and even net worth to total assets gives a similar picture. These are merely suggested as an indication that probably the authors were too intent on stressing the significance of the working capital ratio to see the significance of other important ratios.

JACOB SWART

Colorado College

Control of the Retail Units of Chain Stores, by Edgar H. Gault. Bureau of Business Research, University of Michigan. 1935. 99 pp. $1.00.

This monograph discusses four main types of control as practiced by various chain store organizations; namely, control of merchandise, of inventory, of finances, and of personnel. The material presented is based on data obtained from articles appearing in periodicals, particularly the *Chain Store Age* and from interviews with the executives of 62 chain organizations.

The chains included in the survey cover a wide range with regard to the features which the author shows influence the operating and control methods; in type of merchandise, from variety to furniture; from small local chains to national chains; in number of outlets, from an average of 7 in confectionery and restaurant chains to 3,260 in grocery chains.

The material represents, therefore, a large cross-section of American chain stores, and the author outlines in a clear and concise manner the principal features of their operating methods under the headings mentioned above. A few of the topics covered are: How and why certain chains maintain a policy of uniform stocks and prices; what kind of chains send window display suggestions or materials from the central office, whereas others leave such displays entirely to the store manager; why restaurant and meat chains usually use the cost method of inventory, whereas most other chains use the retail method; the control of expenses through contracts, receipted bills, budgets, and comparisons among stores; and the range of responsibility placed on the manager of the retail store, depending upon the size of the store, the training and experience of the manager, and the amount of direct supervision possible.

Professor Gault states that he is unable to obtain statistical data on the results of the various methods of control and is therefore unable to evaluate them. A person about to set up a chain store organization, however, may find in this book a résumé of the various types of controls now being used under certain conditions, but the details of the control methods are missing. No samples of printed forms or of reports are given to illustrate reports mentioned. It seems strange, also, to find no bibliography. Although the literature on chain stores is not extensive, similar methods of control are used in department stores, and references to more complete description of control methods would be useful. For instance, Professor Gault gives a rather elementary outline of the retail method of inventory; for a more complete analysis of this subject, reference might well have been made to McNair's *Retail Method of Inventory*.

MARIE P. SEALY

R. H. Macy and Company, Inc.

High-Level Consumption—Its Behavior; Its Consequences, by William H. Lough, with the assistance of Martin R. Gainsbrugh. New York: McGraw Hill Book Company. 1935. xiii, 330 pp. $4.00.

High-level consumption is not specifically defined by Mr. Lough, but several statements made by him can be pieced together into an implied definition. In the seven years 1923–1929, "more than three-fifths of American families, according to competent estimates, after covering their subsistence requirements had money to spare for comforts and luxuries. . . . The essentially different character acquired by consumption when it climbs well above the subsistence level is only vaguely understood. . . . One plain char-

acteristic of high-level, in contrast with low-level, consumption is its fickleness. . . . An associated characteristic is unpredictability."

This "high-level—that is, a fickle and unpredictable—consumption" is then measured, analyzed, and forecast in so far as the facts will support forecast. Finally, the book seeks "a factual, rational answer to the life-or-death riddle which is posed to our generation: how to attain a lasting workable balance between expanding productive capacity, on one side and a high-level . . . consumption, on the other side."

The measure of consumers' outgo for the period 1909–1931 is obtained by the following steps: (1) "Producers' values of all classes of commodities which are, in whole or in part, ready-for-purchase by consumers" are tabulated, partly from actual figures reported in the Census of Manufactures, Census of Mines, etc., and partly from estimates as, for example, the value of home-grown, home-consumed goods. (2) Imports are added to and exports deducted from the producers' values. (3) The estimated proportion of each class of commodity taken by consumers is then applied to the producers' values to obtain the estimated producers' values of consumers' goods. (4) The estimated spread between producers' values and prices paid by consumers are added to the producers' values for each class of commodity. (5) The index of department store stocks reported in the *Survey of Current Business* is used to adjust for inventory changes. At this stage the figures represent estimated "Consumers' Outgo" for commodities at current (unadjusted) dollar values. (6) Total outgo for personal services in each year is estimated by multiplying the estimated number of persons engaged in various professional, commercial, and domestic occupations by the estimated average gross earnings. (7) Total outgo is estimated for other intangibles, such as transportation fares, automobile insurance and taxes, gasoline taxes, home rentals, imputed rental value of owner-occupied homes, public utility services, moving expenses, club dues, theatre tickets, postage, foreign travel, etc. (8) An estimate is made of the amount of each class of intangibles taken by consumers. (9) The amount of taxes paid directly by consumers and the amount of savings out of current individual incomes are estimated and classed as "Outgo for Withholdings." (10) Total "Consumers' Outgo" for commodities, for intangibles, and for withholdings for the period 1909–1931 is then classified into twelve major groups of expenditure items.

The data are then adjusted for changes in the general price level for the analysis of "Consumers' Outgo" and for changes in the price level for each class of commodity or service for the analysis of "Consumers' Takings."

The analysis of the data and the conclusions drawn are extremely interesting. The grouped data on "Outgo" and "Takings" are analyzed in terms of their proportionate distribution among classes of goods, their trends, their stability and instability, their relation to subsistence vs. "free spendables," their relation to buying motives, and their elasticity. On a basis of the analyses made and the conclusions drawn forecasts are presented concerning the probable distribution of "Consumers' Outgo" if the average family outgo should increase by varying amounts. Finally, it is suggested that in-

stead of national planning, we need greater flexibility in the economic system with more information, more widely disseminated, and more intelligently utilized by private business.

The entire book is built around a framework of estimates. The authors frankly admit the weakness of many of their estimates, but point out the lack of actual data. Some of the conclusions drawn, however, are conditioned by the hypotheses and methods used in estimating. For example, the statement is made that distribution costs paid by consumers have had "a definite, though slow, downward trend. The trend arises not so much from changes in margins as from gradual modification of the make-up of consumers' purchases." For all commodities, with a very few exceptions, a constant proportion of producers' values is allowed each year as spread between producers' values and prices paid by the consumers.

Further, with a few minor exceptions, a constant proportion of each class of commodities is assumed to have been purchased from year to year by consumers. Finally, changes in the distribution of consumers' outgo from year to year are analyzed as a function of changes in the average family total expenditure. Changes in the distribution of families' income and spending levels are not known and are, therefore, not taken into account.

EMMETT H. WELCH

State Emergency Relief Board
Commonwealth of Pennsylvania

Regional Shifts in the Bituminous Coal Industry, With Special Reference to Pennsylvania, by Wilbert G. Fritz and Theodore A. Veenstra. Pittsburgh: University of Pittsburgh. (Bureau of Business Research Monographs Number 4.) 1935. 197 pp. $2.00.

This book is a substantial addition to the vast literature on coal. The darkest spot in the store of information on coal is in the field of marketing and distribution, and this book does much to throw light on this field. Though the study revolves around the competitive markets for Pennsylvania coal, a great amount of data are presented concerning the markets for coals from other producing districts.

The major portion of the book is devoted to a detailed analysis of the origin and destination of shipments of bituminous coal from Pennsylvania. Conversely, an analysis is made of the source of coal received in the principal markets, and the proportion that came from the Pennsylvania districts. In addition, material is assembled on consumption of coal by uses, and so far as possible the consumption by use is traced from the origin district to the place of use. The many shifts that have taken place in the competitive arena are pointed out, and a serious effort is made to give the reasons for the shifts. Such a study is of great value to both producers and purchasers of coal.

The second part of the book deals with the public interest in bituminous coal and discusses a national policy for the industry. The authors give a

very able analysis of the problem, review the past and proposed remedies, and make a critical appraisal of the proposed remedies.

All those interested in coal or in the social control of industry will find this book of value.

W. H. YOUNG

U. S. Bureau of Mines

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